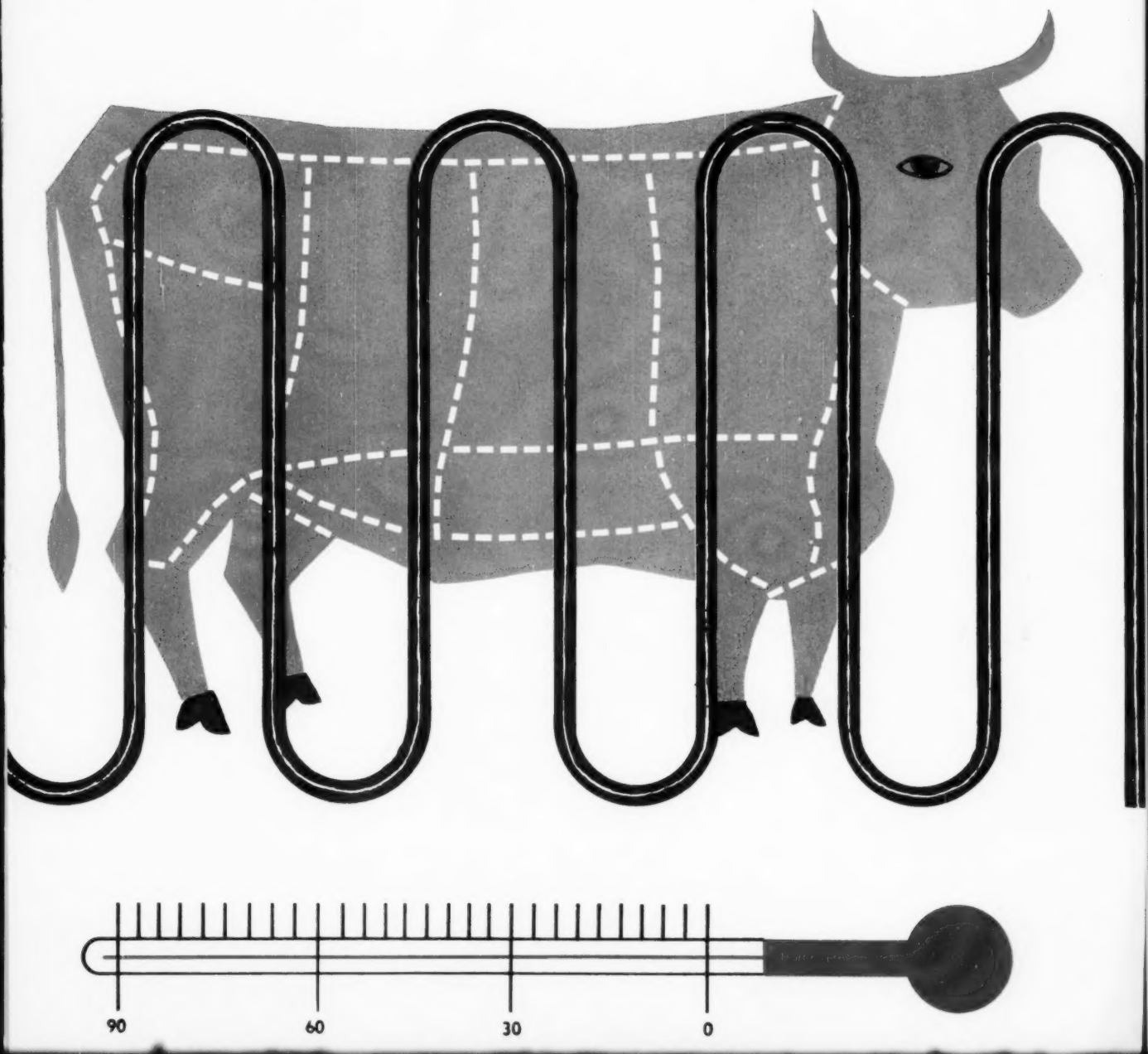
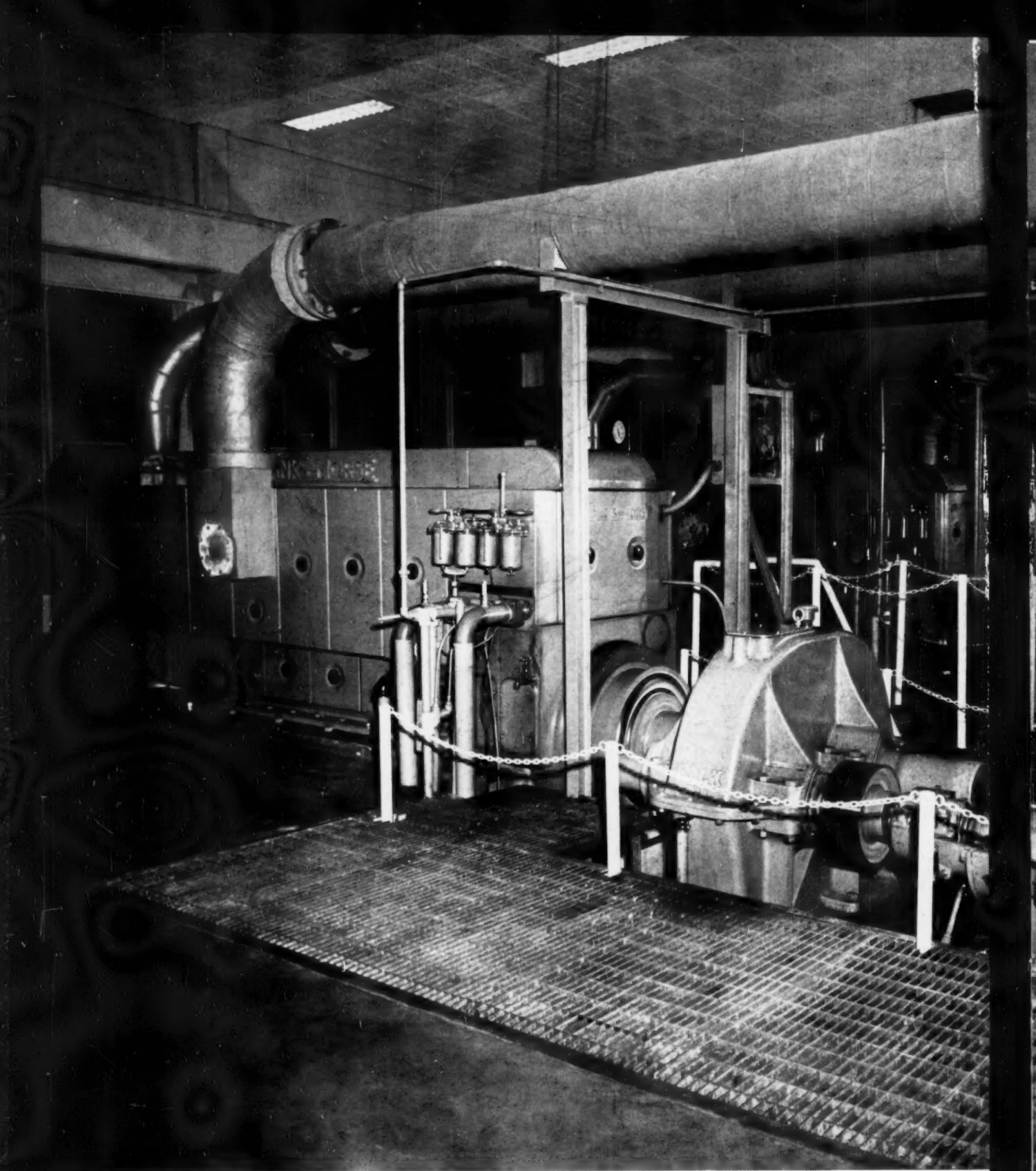
diesel power

SEPTEMBER 1954

Refrigeration: a new market for Diesels

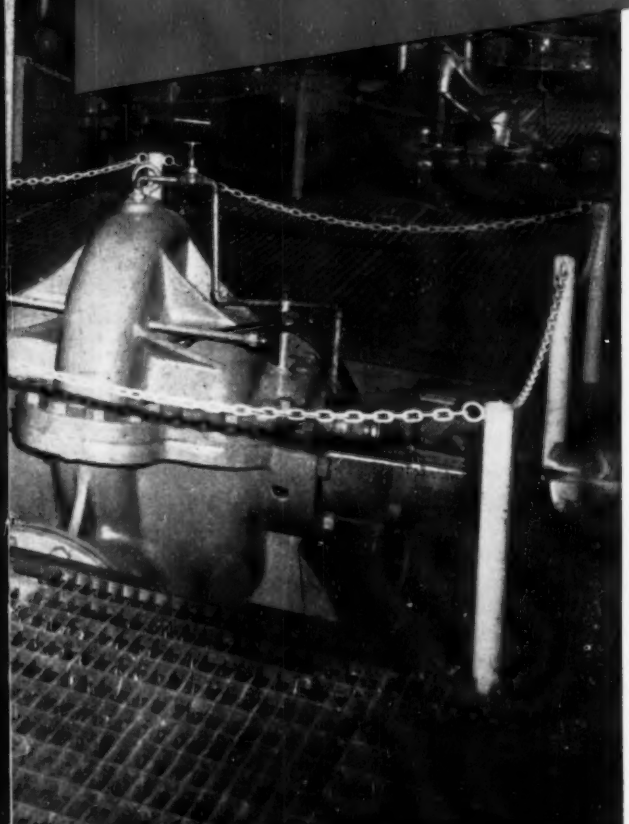




TEXACO

TEXACO
REG. T.M.

Pumping station dual-fuel engines kept "EXCEPTIONALLY CLEAN..."



IN THIS pumping station (name on request) pumps are driven by three Fairbanks-Morse dual-fuel engines, lubricated with one of the famous *Texaco Ursa Oil* series. Operation has been *"exceptionally clean—no sludge in crankcase, no carbon formations, and rings free in their grooves. Wear is negligible . . . low maintenance costs and low fuel consumption."*

Benefits like these account for the fact that—

For over 20 years, more stationary diesel h.p. in the U.S. has been lubricated with Texaco than with any other brand.

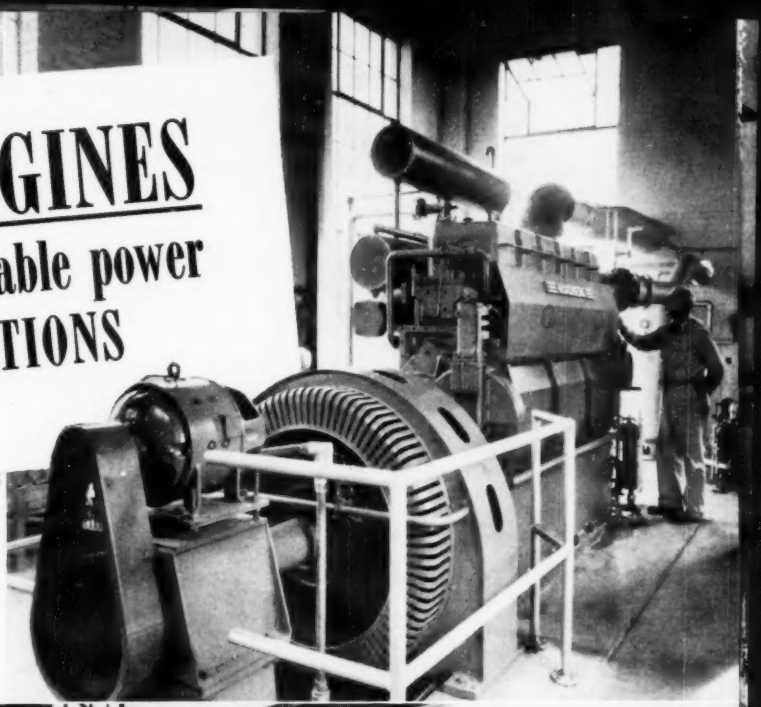
The famous *Texaco Ursa Oil* series is a complete line of lubricating oils especially refined to make diesel, gas and dual-fuel engines deliver *more power* with *less fuel* over *longer periods* between overhauls.

Let a Texaco Lubrication Engineer show you how effective lubrication—*Texaco*—can benefit your plant. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

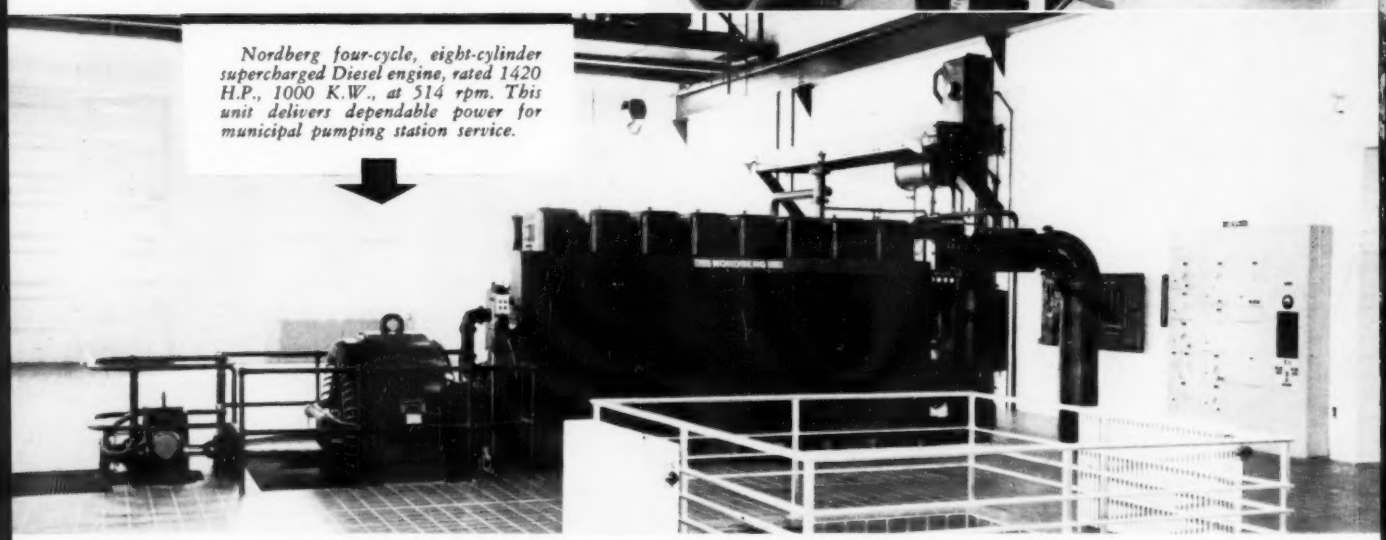
The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

NORDBERG ENGINES
furnish low cost, dependable power for PUMPING STATIONS



Nordberg four-cycle, six-cylinder Duafuel® engine rated 375 H.P., 250 K.W., at 600 rpm. This unit, operating on natural gas, powers two motor-driven centrifugal water pumps.



Nordberg four-cycle, eight-cylinder supercharged Diesel engine, rated 1420 H.P., 1000 K.W., at 514 rpm. This unit delivers dependable power for municipal pumping station service.

WHEN it comes to furnishing reliable, low cost power for municipal and industrial pumping operations, Nordberg engines have been thoroughly job-tested and proved in numerous installations in many parts of the world. Two typical Nordberg Diesel Engine Generator units are shown here, each providing the necessary power to keep electrically-driven water pumps on the job, day-in, day-out.

Built to provide the most economical power plant with low first cost as well as low operating costs, Nordberg engines will efficiently burn Diesel fuel, natural gas, or any combination of both—as well as sewage gas, manufactured gas and propane. With this wide fuel selection Nordberg can furnish the most efficient unit to meet specific power requirements . . . for pumping applications and for main or stand-by-power in almost every class of service.

Nordberg, as builders of America's largest line of heavy duty engines, in sizes from 10 to over 10,000 H.P., backed by over a half century of specialized machinery building experience, can give you valuable assistance in solving *your* particular power problem. Call or write for further information. *Nordberg Mfg. Co., Milwaukee, Wis.*

NORDBERG

NORDBERG MACHINERY BUSCH SULZER

DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

P554

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Georg J. Linder
German Representative
Wittelsbacher Allee 60
Frankfort/Main, Germany

Publisher
G. Renfrew Brighton

Assistant Publisher
Wilbur W. Young

Subscription Rates

	Single Copies	1 year	2 years	3 years
U. S.	35¢	$3.00	$5.00	$ 6.00
Canada	40¢	4.00	7.00	9.00
Foreign	40¢	5.00	8.00	11.00

Diesel Power is indexed regularly by Engineering Index, Inc. and is available in microfilm editions from University Microfilms, Inc., Ann Arbor, Michigan.

DIESEL POWER for September, 1954. Vol. XXXII, No. 9. It is published monthly by Diesel Publication, Inc., Kutztown, Pa. Executive and Editorial Offices at 192 Lexington Ave., New York 16, N. Y. Tel. MUrray Hill 3-9874. Entered as second class matter at the Post Office, Kutztown, Pa., under Act of March 3, 1879. Copyright 1954, Diesel Publications, Inc.

diesel power

Established in 1923 **Vol. 32, No. 9** **September, 1954**

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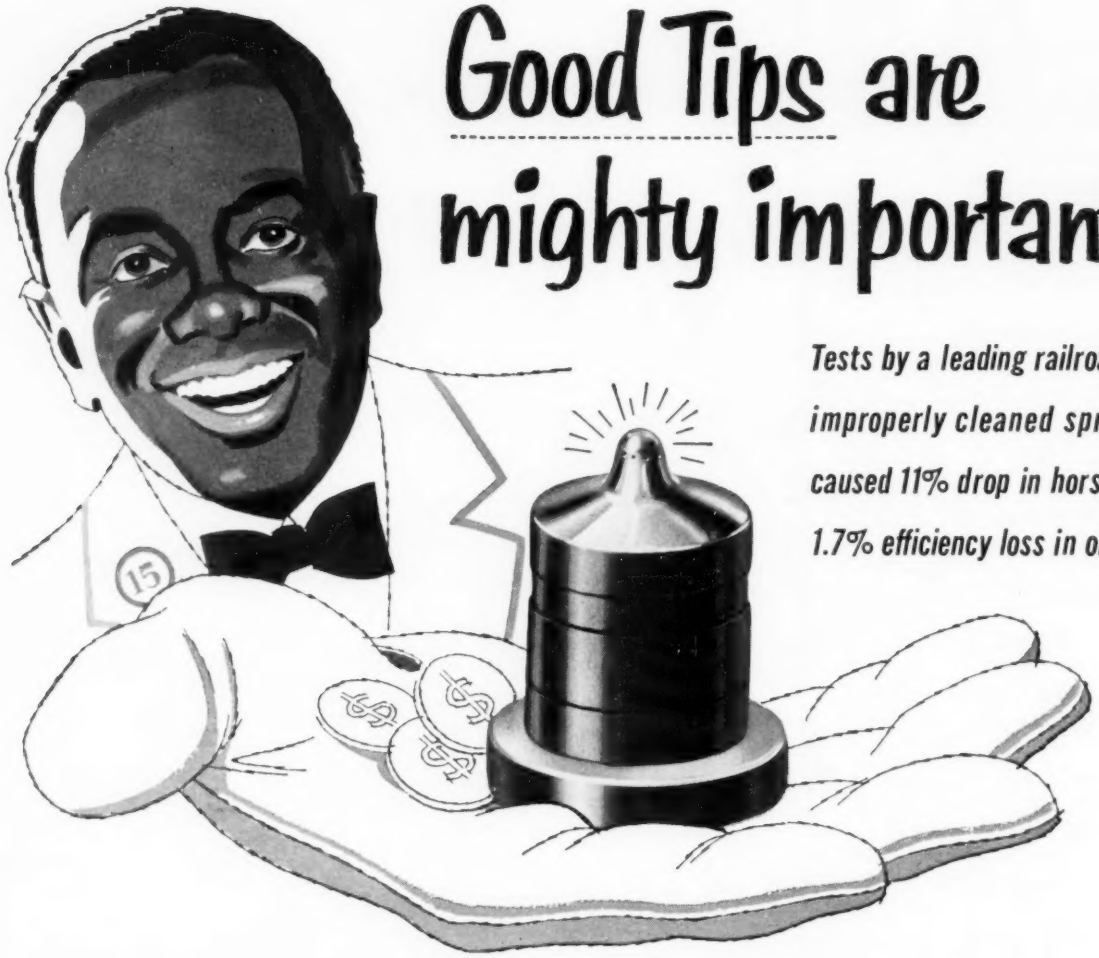
Diesel Publications, Inc., 192 Lexington Avenue, New York 16, N. Y.

Cable Address: Dieselpub — New York

This Month's Cover

Refrigeration of food products, symbolized for the meat industry by our cover, is an expanding market diesels at every step—at the source, in distribution, and in storage.

Good Tips are mighty important!



Tests by a leading railroad show improperly cleaned spray tips caused 11% drop in horsepower, 1.7% efficiency loss in one year.

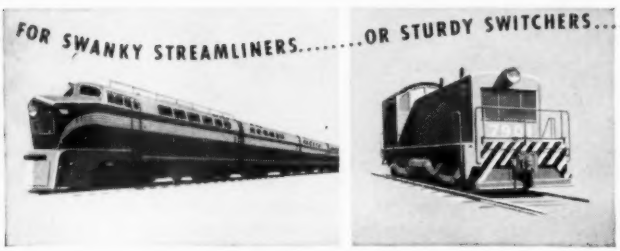
Proper maintenance of equipment is a major problem for any railroad, and much time, effort and money are expended to keep power plants functioning at peak efficiency.

Even the smallest type of equipment such as the spray tips on your fuel injection equipment can cause serious efficiency losses unless properly maintained, as evidenced by recent tests made by one of America's leading railroads.

To assure that operators get full performance out of Bendix Fuel Injection Equipment, we have prepared a special folder showing the best proven method of maintaining the original high polish on spray tips in order to reduce carbon deposits to a minimum.

Send today for your copy of the Bendix bulletin, "How To Clean Spray Tips".

SCINTILLA DIVISION OF Bendix AVIATION CORPORATION
SIDNEY, NEW YORK



BENDIX*
FUEL INJECTION EQUIPMENT

*REG. U.S. PAT. OFF.

Western Office: 582 Market Street, San Francisco 4, California
Export Sales: Bendix International Division of Bendix Aviation Corporation
205 East 42nd Street, New York 17, N. Y.

Come One!.. Come All!.. Come In!.. See Our New

VAN NORMAN No. 253 CAMSHAFT GRINDER!

Swift's Shop Service Inc.

Here's how to Bring Business in . . .

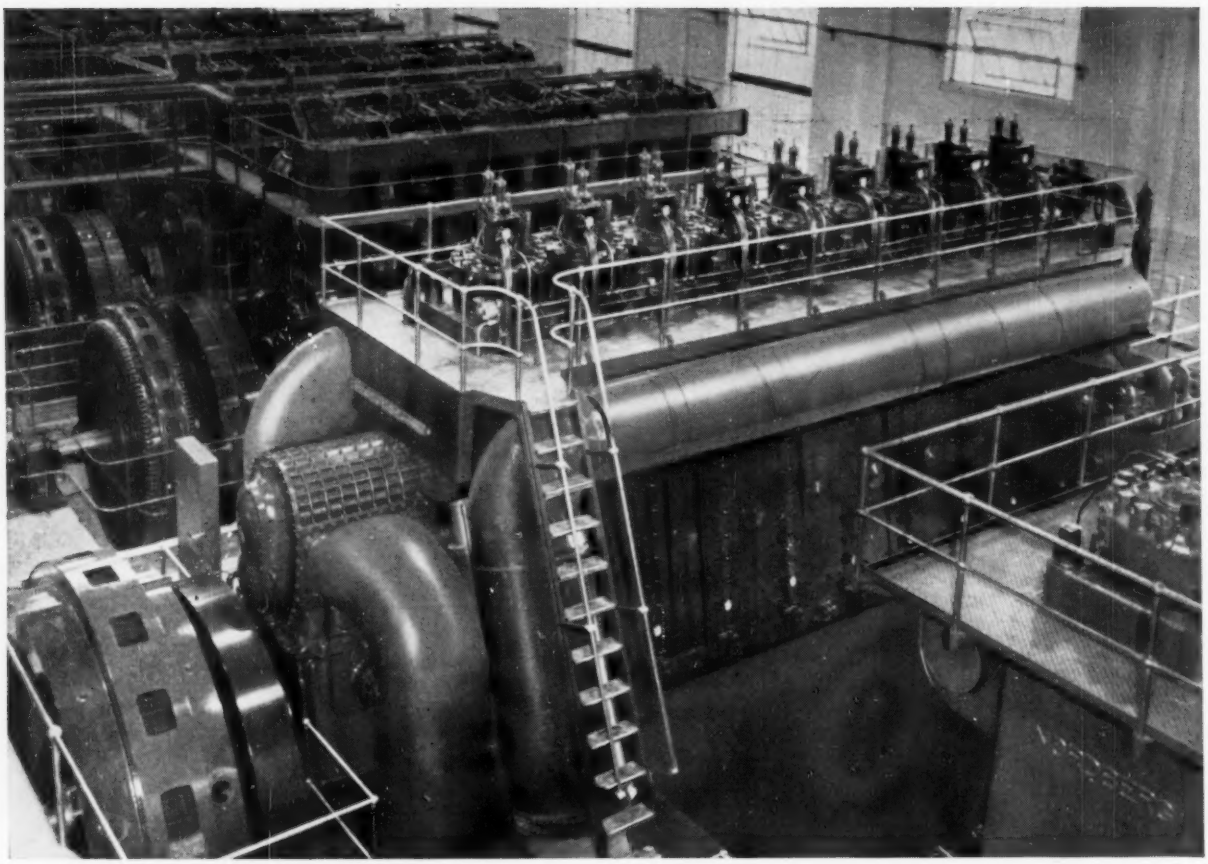
Put yourself first in the field with this new service! You'll open up new markets . . . bring in new fleet customers . . . sell more parts and make more work for the other machines in your shop.

This new Van Norman No. 253 restores new-car power . . . smooths engine idling . . . reduces valve noise . . . extends engine life. It produces master cams quickly and accurately with new exclusive turning and grinding method. Other exclusive Van Norman features include: Positive control for taper-grinding cam lobes . . . precision indexed head for positive cam location . . . Rap-O-Matic wheel retractor . . . positive semi-automatic size control. Get the complete profit-picture on these and other exclusive features of the new No. 253. See your jobber or write Van Norman Co., Springfield 7, Mass.

Section of camshaft shows wear on partially ground lobe . . . also properly ground, completely finished lobe . . . and old and new surface on main bearing.

The Best-Equipped Shop Gets the Business!

that's why ***"It Pays to Van Normanize"***



Largest Diesel Power Generating Station in the U.S.

reduces cylinder and piston ring wear with SHELL ROTELLA OIL

Electric power for the City of Grand Haven, Michigan, and the surrounding area, is generated by diesel engines in the largest municipal power station of its kind in the U. S. A. Shell Rotella Oil is the cylinder lubricant.

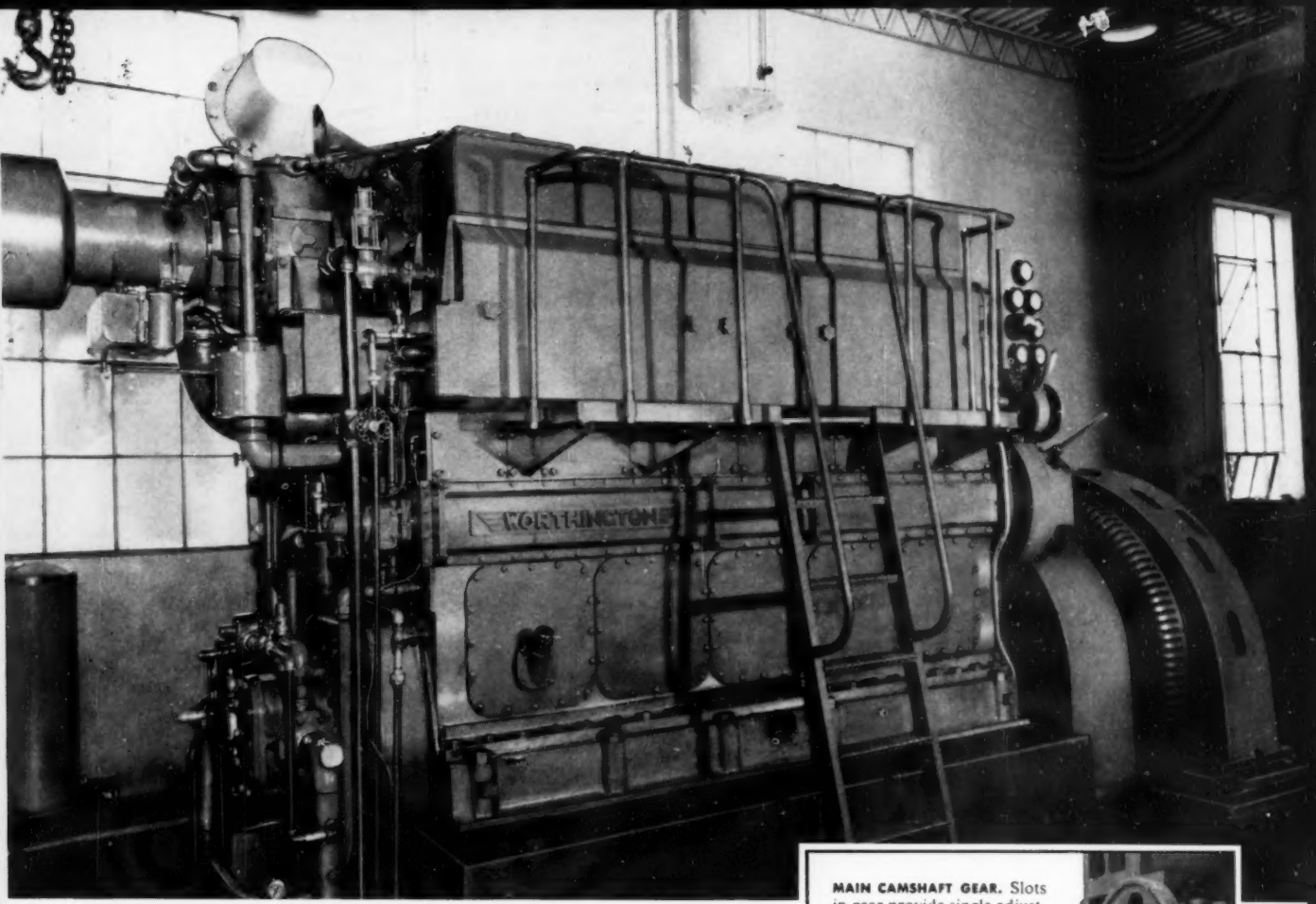
The anti-corrosive action in Shell Rotella Oil combats the major cause of engine wear . . . cylinder and piston ring wear caused by acid action from the by-products of incomplete combustion and condensation.

Tougher lubricating film in Shell Rotella Oil gives cylinders and rings greater protection . . . minimizes wear. Its effective detergent-dispersant action prevents harmful deposits.

Write for technical information. See for yourself how Shell Rotella Oil can help reduce your engine maintenance costs.

SHELL OIL COMPANY
50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

SHELL



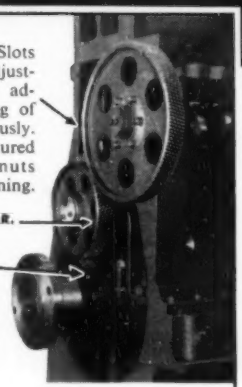
NEW SUPERCHARGED WORTHINGTON TYPE SDR DIESEL ENGINE in the Grand Marais Light and Power Company was specified for its economy of fuel consumption.

Grand Marais, Minn., installs second Worthington Diesel

Six years of efficient performance from their first Worthington Diesel left no doubt as to Grand Marais' choice of a second engine. When demands for power increased, they installed the new Worthington Diesel shown above.

This town, near the Canadian border, has no railroad. Thus maximum engine efficiency was most important in its decision, because of high fuel costs. The new Worthington SDR engine has already effected impressive savings in fuel, lubricating oil and maintenance costs.

Worthington's exclusive features increase your plant's efficiency, lower your operating costs. For more facts on Worthington engines—gas, Diesel or dual fuel—write for Bulletin S-500-B52A to Worthington Corporation, Engine Division, Buffalo, N. Y.



MAIN CAMSHAFT GEAR. Slots in gear provide single adjustment for retarding or advancing injection timing of all cylinders simultaneously. Final gear adjustment secured with castellated locknuts wired after final tightening.

FREE FLOATING IDLER GEAR.

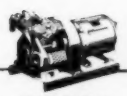
SPLIT GEAR KEYED ON CRANKSHAFT. Permanent adjustment for perfect alignment with idler gear is easily accomplished.

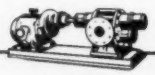
WORTHINGTON HELICAL STEEL GEAR TRAIN
used on Worthington dual fuel engines . . .

1. Provides accurate and positive control of engine timing.
2. Is located at flywheel end of engine for smooth gear operation as power impulses are absorbed by the flywheel.
3. Uses controlled automatic oil jet lubrication that eliminates wear.
4. Assures correct engine timing . . . keeps engine running smoothly . . . results in low fuel consumption and minimum engine maintenance.

E.3.3

Worthington-Built Auxiliaries


ENGINE STARTING COMPRESSORS


OIL TRANSFER PUMPS.

COOLING WATER CIRCULATING PUMPS

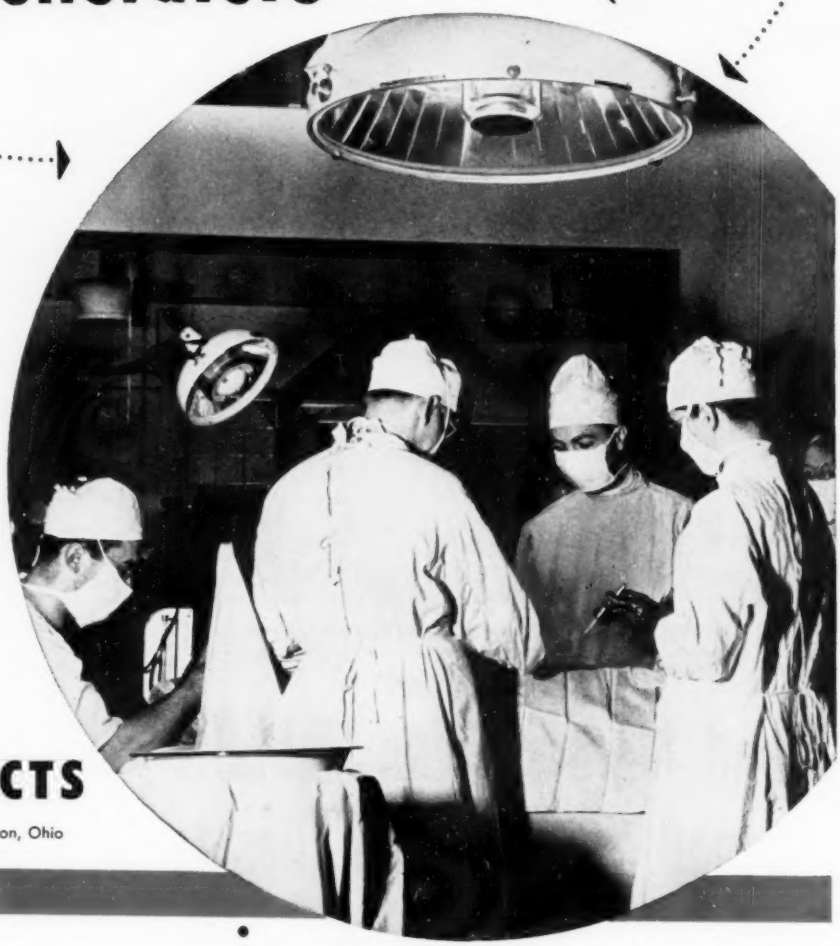
EVAPORATIVE-TYPE ENGINE WATER COOLERS

Economical Continuous Power—Diesels, Oil and Dual Fuel, and Spark-Ignition Gas Engines, from 190 to 2,100 bhp.

WORTHINGTON
Engines

For stand-by power

Delco Generators



Delco generators are designed to serve Diesel power plants effectively . . . and without fail. With a power range of 20 kw through 200 kw, AC and DC, 1200, 1500, and 1800 rpm, Delco generators have kept pace with Diesel engineering.

Hospitals, schools, public buildings, carnivals, circuses and outside construction jobs frequently call for power from an independent source. At such times Delco generators, time and again, prove their dependability for stand-by or portable service. Any of the sales offices listed below will be glad to supply detailed information.

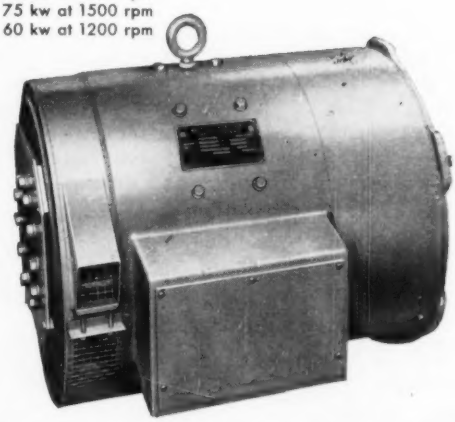
DELCO DAYTON OHIO

DELCO PRODUCTS

Division of General Motors Corporation, Dayton, Ohio

AC GENERATORS
20 kw through 150 kw at 1200 rpm
20 kw through 200 kw at 1800 rpm

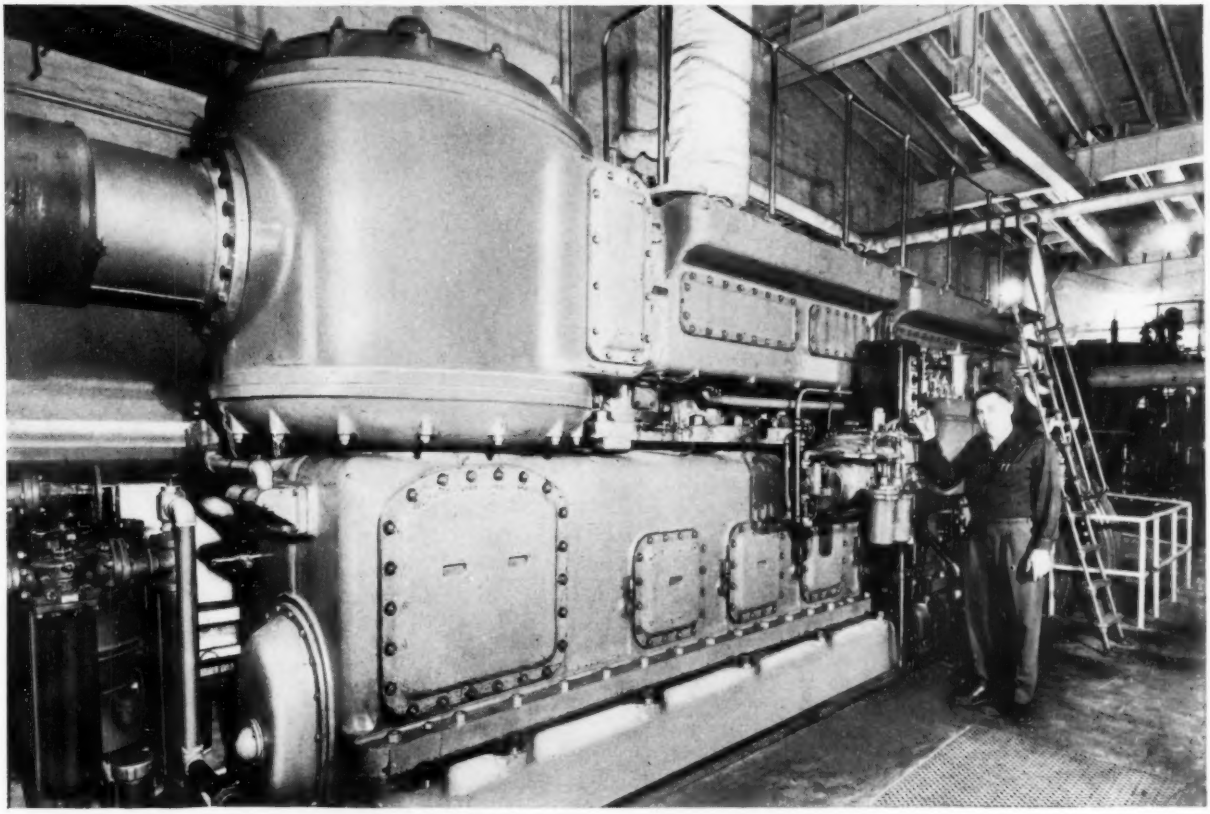
DC GENERATORS
20 kw through 90 kw at 1800 rpm
20 kw through 75 kw at 1500 rpm
20 kw through 60 kw at 1200 rpm



SALES OFFICES:

ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • EVANSVILLE • HARTFORD • KANSAS CITY • LOS ANGELES • PHILADELPHIA • ST. LOUIS • SAN FRANCISCO • SYRACUSE

"Our tests show Gascon® Oils best!"



. . . says A.E. Harms, CHIEF ENGINEER

YUKON MILL AND GRAIN COMPANY, YUKON, OKLAHOMA

It's *doubly* important that the Yukon Mill and Grain Company's 5 diesels operate with as little trouble as possible. For this plant not only supplies power for the mill, but also for the City of Yukon.

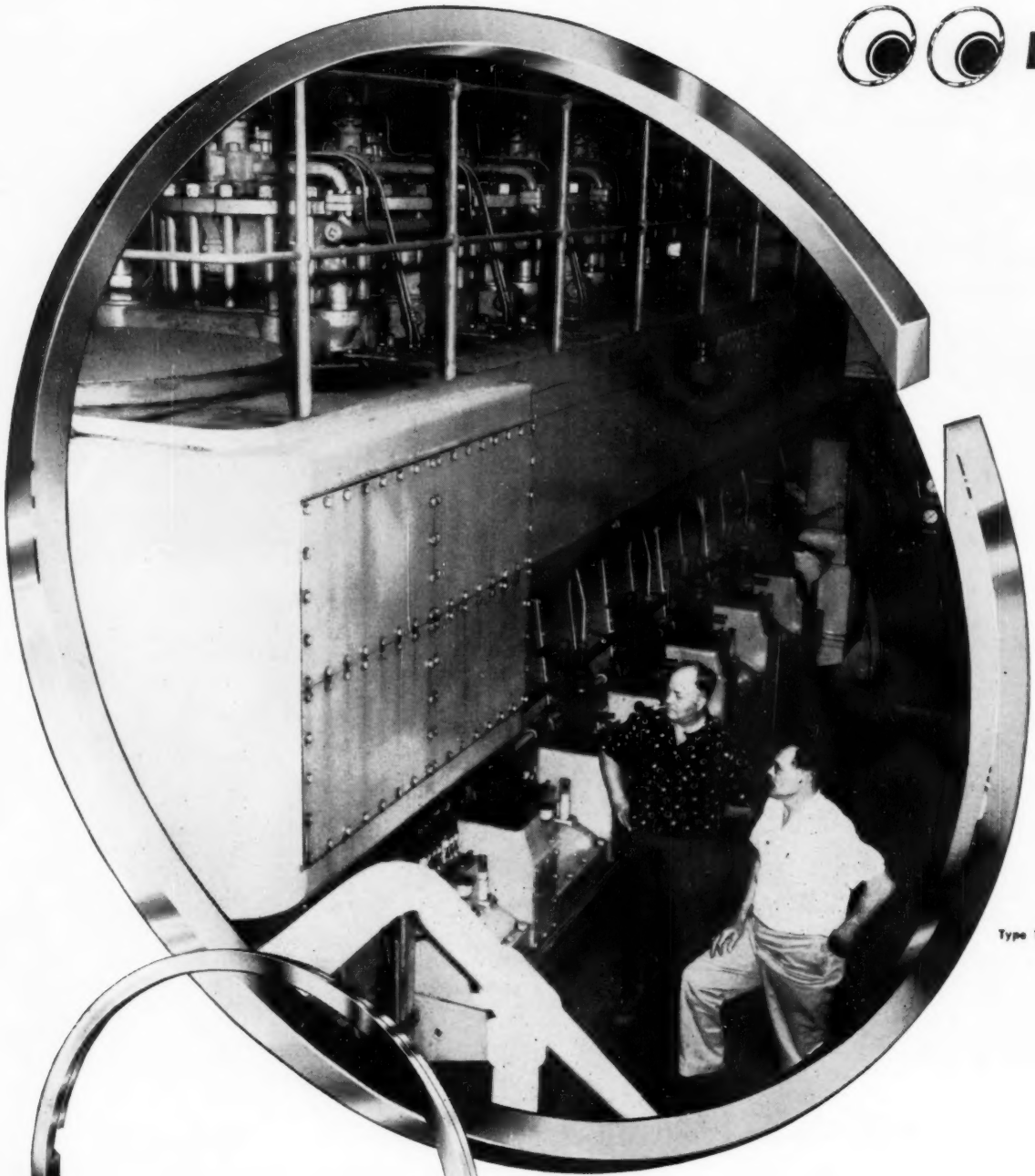
Chief Engineer Harms writes, "When we changed to Sinclair GASCON Oil D-HD, the results were extremely satisfying – wear has been greatly reduced, varnish is gone from pistons and cylinders and stuck rings are a thing of the past. As you might expect, we now use Sinclair exclusively."

You too, can rely on Sinclair's full line of top quality diesel lubricants. Phone your local Sinclair representative or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR DIESEL LUBRICANTS

save wear and replacements

Look



Type 101 Ring

Cooktite Ring

RE-TURNING MAKES BETTER RINGS!

Because they are re-turned as a final manufacturing process, Cook Piston Rings are light-tight, and conform perfectly to the cylinder wall. This eliminates the possibility of scuffing during initial operation. The perfect conformity of re-turned Cook Rings prevents hot gasses from blowing by and impairing lubrication when it is needed most. The result — *longer life and more efficient performance!*

to COOK for Better Rings!

COOK PISTON RINGS Save Key West $41,670, on ONE 2400-HP Diesel Engine!

2400-HP DIESEL ENGINE	OPERATING WITH BRAND "X" RINGS	COOKTITE SEALING RING COMBINATION
Total hours operated with each brand — average of all cylinders —	10,700	44,842
Rate of cyl. wear per 1000 hours' operation —	.00148"	.00024"
Ring cost per 1000 hours' operation —	$161.00	$59.00
Hours operated — average per piston — pulling job —	2627	4061
Total generator output — kwhrs —	12,596,100	59,094,900
Average kwhrs/gal. fuel consumed —	12.17	12.77
Gal. fuel saved a/c increased efficiency with Cook Rings —		228,149
Total saving on fuel @ 11c per gal. —		$25,096.00
Total saving a/c reduced cyl. wear rate with Cook Rings (1 set liners) —		12,000.00
Saving on ring cost — $102.00 per 1000 hours for 44,800 hours in favor of Cook Rings —		4,574.00
Total saving in favor of Cooktite Sealing Ring Combination		$41,670.00

HERE'S $41,000 worth of reasons why the Key West Electric System uses Cook Piston Rings *exclusively*, in all its Diesel engines. It's the performance record of their No. 12 unit — a 2400-HP engine which after 55,542 hours, had racked up the savings shown above.

Exceptional performance? Yes, but it's also *typical*. Read what Key West Electric System's Chief Engineer, L. W. Whitmarsh, has to say about Cook Piston Rings:

"Proportionately, the same economies have been obtained from the use of Cook Piston Rings in all of our other engines, which accounts for our continuing to use them exclusively."

Use the coupon for full product information and the name of your nearby Cook representative. C. Lee Cook Mfg. Co., Inc., Louisville 3, Ky.

C. LEE COOK MANUFACTURING CO.

Sealing Pressures Since 1888

C. Lee Cook Manufacturing Co.
912 South 8th Street
Louisville 3, Kentucky

Gentlemen: Please send me complete information on Cook Piston Rings and name of nearest representative.

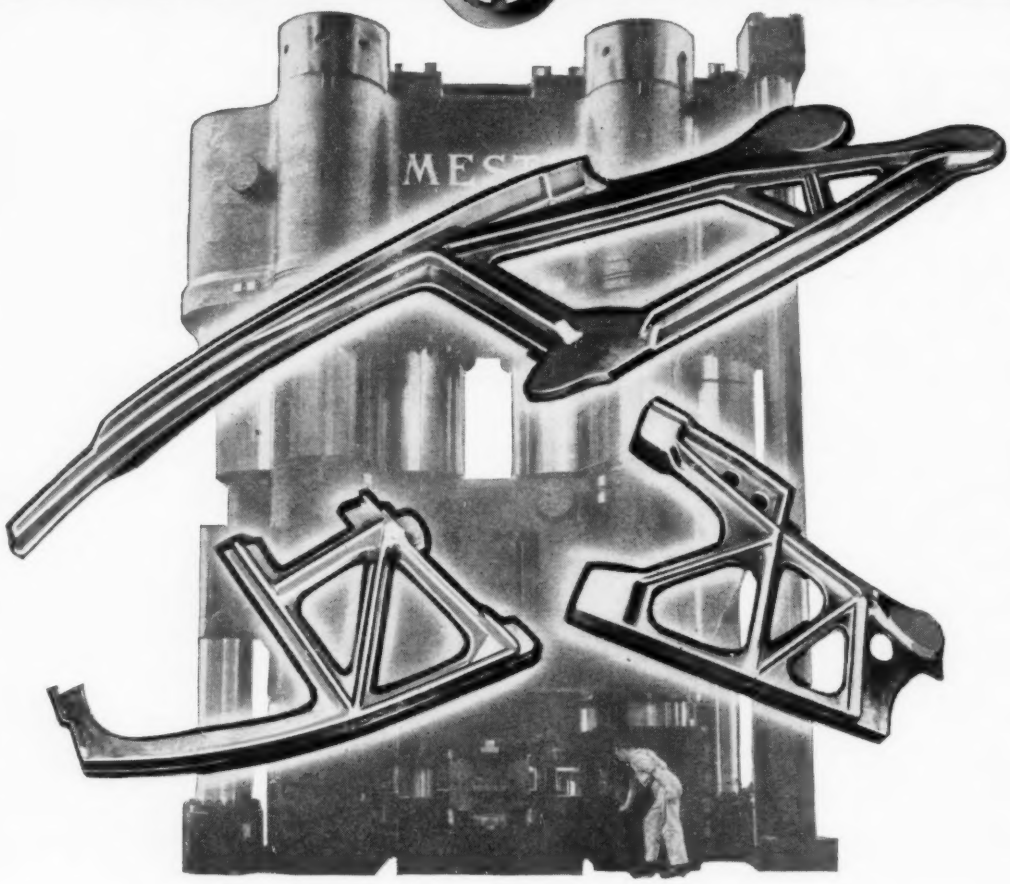
Firm_____

Street_____

City_____ State_____

Attention:_____

Type of Units_____



Greater Size and Speed in Aircraft have created engineering problems, the solution of which has required larger and larger forgings of high-strength aluminum alloy. *Examples* shown above are forged structural members used in a modern military bomber, the largest more than seven feet over all. These are forged on an 18,000 ton press, the biggest ever built in this country.

Wyman-Gordon Experience—the most extensive in the industry—is keeping abreast of new forging demands involving the use of Steel, Aluminum, Magnesium, High Density Alloys and Titanium.

• • •

Standard of the Industry for More than Seventy Years

WYMAN-GORDON

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM

WORCESTER, MASSACHUSETTS

HARVEY, ILLINOIS DETROIT, MICHIGAN

GM DIESEL
CASE HISTORY NO. 537-42

USER: C. H. Snyder
Coal Company,
Cowansville, Pa.

INSTALLATION: GM "6-71"
2-cycle Diesel replaced
4-cycle Diesel in shovel
over 2 years ago.

PERFORMANCE: Owner
C. H. Snyder reports
better performance,
25% more production
with GM Diesel power.
GM Diesel starts faster,
uses less lube oil, gives
smoother operation.

It Pays to Standardize on

... available in more than 750 models of equipment built by over 150 manufacturers

GM
GENERAL MOTORS
DIESEL
POWER

Production up 25% with

GM DIESEL POWER

When his shovel was two years old, owner C. H. Snyder switched to General Motors Diesel power and upped production from 8,000 to 10,000 tons of coal per month. He converted to GM Diesel because these 2-cycle Diesel engines have given him dependable low-cost performance in a tractor, dragline, truck and another shovel.

Fast-accelerating, smooth-running GM Diesels do more work at less cost in new equipment or old. They start at the push of a button even in coldest weather—deliver power at every piston downstroke to speed operations, boost production. Low-cost parts are readily available and GM Diesel distributors back up GM Diesel performance with on-the-spot service. Call your distributor today—ask him about low-cost horsepower for *your* job.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines . . . 30 to 300 H.P. Multiple Units . . . Up to 864 H.P.

faster, smoother

The watchwords of today's American railroads—faster, smoother travel—are typical of the Pennsylvania Railroad's stream-liner, the Spirit of St. Louis, which makes the trip between St. Louis and New York an enjoyable experience for the traveler.

Gulf Dieselmotive Oil contributes to the fine performance of the giant Diesel engines that power the Spirit of St. Louis and many other crack trains. Here's how this top quality Diesel locomotive lubricant helps keep maintenance costs down, availability up:

1 Effective detergent action prevents harmful piston ring belt deposits.

2 Base stocks are selected for their ability to help prevent hard deposits on the piston crown and in the ring belt area.

3 100% solvent refining (removing undesirable constituents) insures greater stability and better bearing protection.

Gulf Sales Engineers, experienced in railroad Diesel operation, are always available to aid you in maintaining high standards of lubrication throughout your system. Write, wire, or phone your nearest Gulf office today, and have a Gulf Sales Engineer call.

Gulf Oil Corporation • Gulf Refining Company • 1822 Gulf Building, Pittsburgh 30, Pa.

GULF

than ever before—

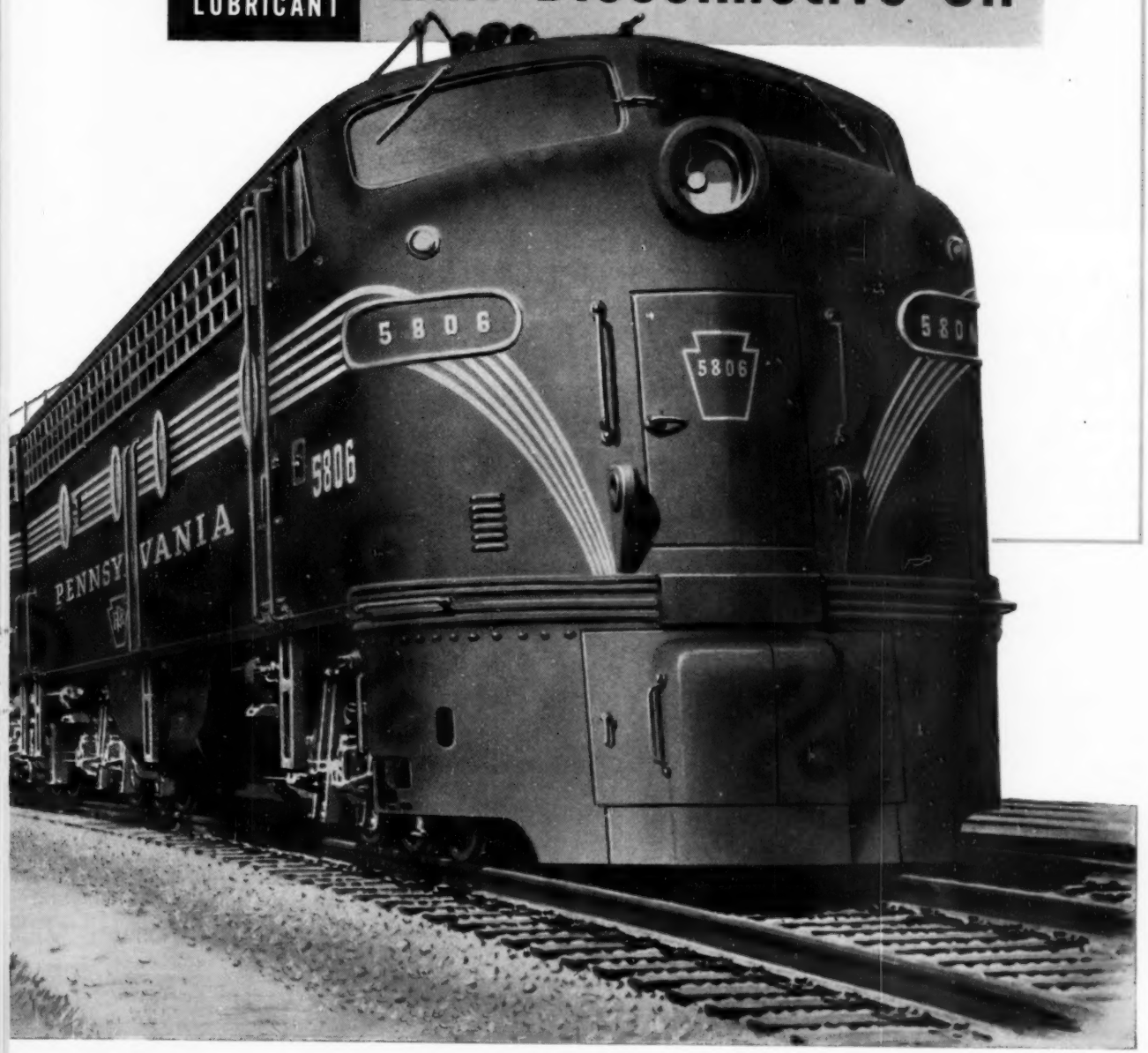
THE TRAIN

the Pennsylvania's crack

"Spirit of St. Louis"

THE DIESEL LUBRICANT

Gulf Dieselmotive Oil

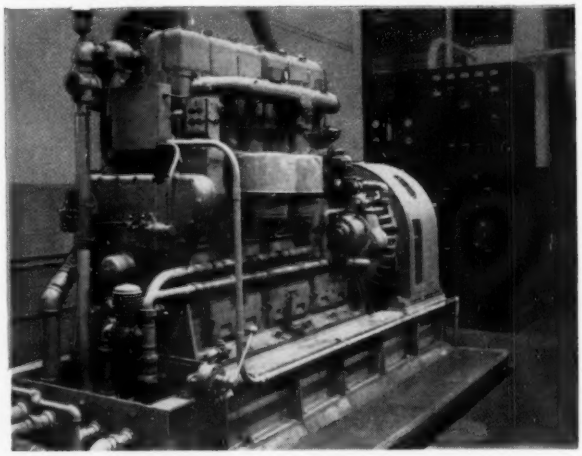


"Round-the-clock" production guarded by SUPERIOR-powered standby generator

To maintain safe levels of illumination, keep plant communications working, and supply power for the fire alarm system and stationary fire equipment are the main objectives assigned to the newly installed standby electrical system at North American Aviation's Columbus, Ohio, plant.

Heart of this system is National Supply's heavy-duty Superior 6G-510 gas engine, rated at 295 BHP for 900 RPM operation of a 200 KW Elliot generator. Because of the plant's size—nearly 300 acres—and the scope of manufacturing operations—17,000 employees on "round-the-clock" production schedules—the dependability and performance of this standby generator is vitally important.

Whatever your power generation requirements, be sure to have the profitable facts of National Supply's complete line (4 to 1765 HP) of Superior, Atlas and Lister diesel engines for power generation. Write or call the nearest sales and service point listed below.



DIESEL DUAL FUEL GAS

THE NATIONAL SUPPLY COMPANY

ATLAS Imperial DIESEL ENGINES

Superior ENGINES

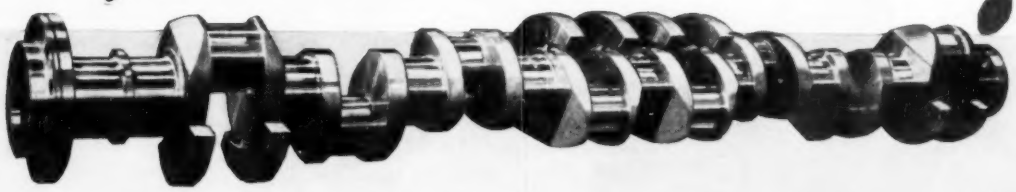
DISTRIBUTOR OF Lister DIESELS IN U.S.A.

THE NATIONAL SUPPLY COMPANY

ENGINE DIVISION PLANT AND GENERAL OFFICES: SPRINGFIELD, OHIO

SALES AND SERVICE POINTS: Gloucester, Massachusetts • Houston, Texas • Fort Worth, Texas • San Diego, California Oakland, California • Terminal Island, California • Ketchikan, Alaska • Washington, D.C. • Chicago, Illinois • Portland, Oregon • Astoria, Oregon • Casper, Wyoming • Halifax, Nova Scotia • Vancouver, B.C. • Toronto, Ontario • Park Rapids, Minnesota • New York, New York • Seattle, Washington • New Orleans, Louisiana • Pittsburgh, Pennsylvania

TOMORROW'S DIESELS
Will depend on ERIE FORGE CRANKSHAFTS

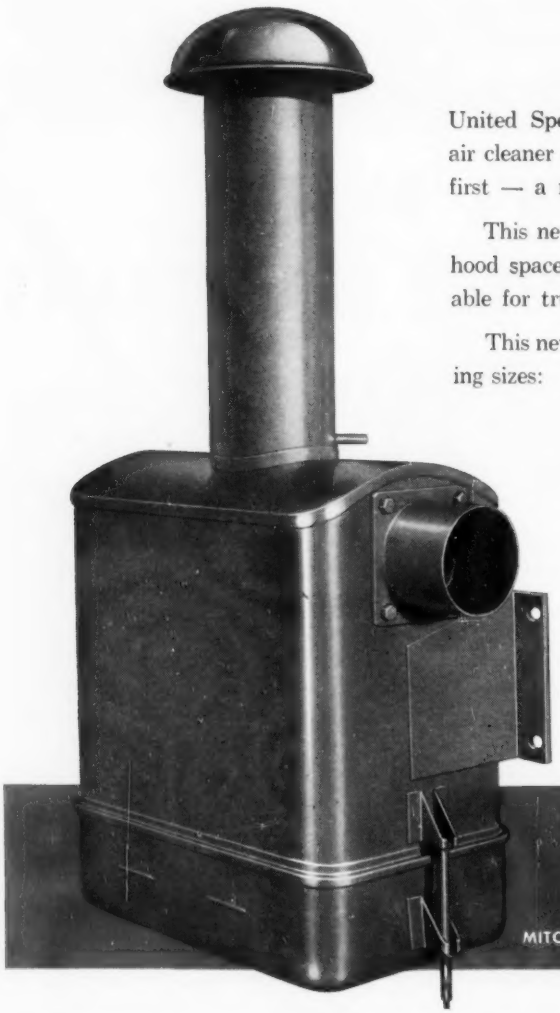


PRECISELY machined Erie Forge Crankshafts have, for many years, been synonomous with highest quality workmanship. At Erie Forge & Steel Corporation every step in production—from ingot to finished crankshaft, is under one control, one supervision. Every operation falls under closest scrutiny, thus assuring perfection in material specification, forging, machining and finishing. Today's diesels for industry, ships and locomotives depend on Erie Forge Crankshafts. Diesel engines of tomorrow will, too, because Erie Forge & Steel Corporation produces the finest forging you can buy.

ERIE FORGE & STEEL CORPORATION
ERIE, PENNSYLVANIA

United Specialties presents

a New Rectangular Diesel Air Cleaner...



United Specialties Company, originator of many new, important air cleaner designs, now announces another significant air cleaner first — a rectangular oil bath air cleaner for diesel engines.

This new design was created to better utilize limited under-the-hood space — provide more space for other accessories. It is available for truck and tractor engines, and for industrial power units.

This new rectangular oil bath air cleaner is available in the following sizes:

5¾ x 9½ for an air capacity of 175 cfm
6½ x 11 for an air capacity of 240 cfm
7½ x 12¼ for an air capacity of 300 cfm
8¾ x 14 for an air capacity of 400 cfm
10 x 16 for an air capacity of 525 cfm
11½ x 19½ for an air capacity of 740 cfm

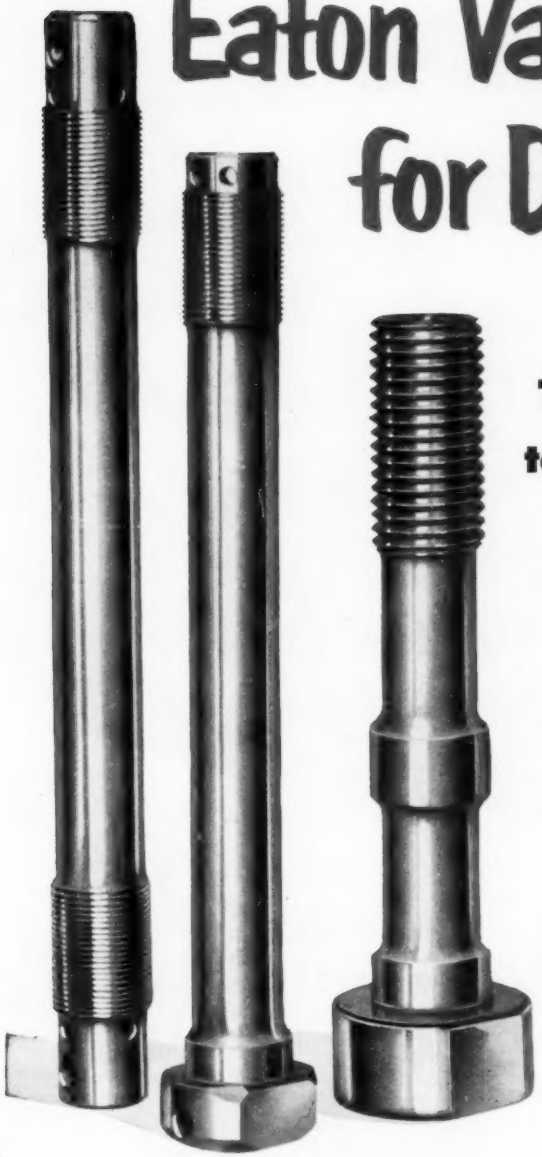
Our sales engineers will be happy to give you full details on the new rectangular diesel air cleaner. Write for complete details.

UNITED SPECIALTIES COMPANY

UNITED AIR CLEANER DIVISION — CHICAGO 28, ILL.
MITCHELL DIVISION — PHILADELPHIA 36, PA. • BIRMINGHAM 11, ALABAMA

Air Cleaners · Metal Stampings · Rolled Shapes · Ignition Switches · Turn Signal Switches · Dovetails

Eaton Valves and Bolts for Diesel Engines



Reflect the Experience of Thirty-Five Years as a Supplier to Leading Diesel Engine Builders

- **Years of forging experience, plus the most modern forging equipment**
- **Heat treatments under strict metallurgical control**
- **Highly specialized precision production facilities**
- **Rigid adherence to customer specifications**

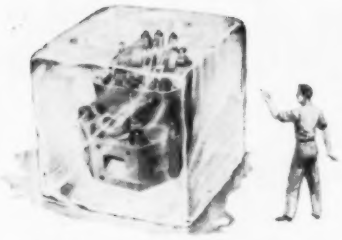
EATON

EATON MANUFACTURING COMPANY

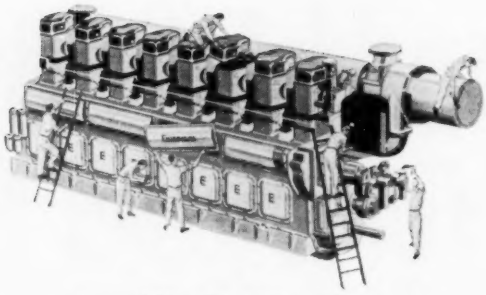
General Offices: CLEVELAND, OHIO

VALVE DIVISION: 9771 FRENCH ROAD · DETROIT 13, MICHIGAN

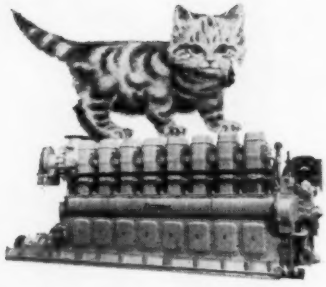
PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers



A really efficient cooling system? No "hot spots" with ENTERPRISE –it never runs too hot or too cold!



Accessibility? It's easy to get to *all* the parts!



Low "noise level" and freedom from damaging vibration? ENTERPRISE Diesels are "quiet as a kitten"!

Mr. Diesel Engine Buyer:

What Do You Look For In A Diesel?

Sustained, continuous and economical performance ...hour after hour, year in and year out!

This is what you want in your next diesel engine. And this is what you will *get* with dependable ENTERPRISE Diesels.

Some of the key features that combine to make ENTERPRISE your best buy in heavy-duty diesels are shown here. There are many others you'll want to know about – up to the minute features of design, materials and construction that are the result of 35 years experience in power research and diesel engine building... features that contribute to the most efficient and reliable power available at a fraction of the cost you'd expect.

Your own comparison will prove that there is no finer diesel. Write for complete information on ENTERPRISE ... *the choice of power experts.* Units from 75 to 2700 hp.

More hours per gallon of lube oil? Every gallon goes further with ENTERPRISE!

True balance for smooth running? ENTERPRISE takes the "jitters" out of diesel operation!

Top service ... where and when you want it? ENTERPRISE customers get fast service ... and parts within hours!

Enterprise DEPENDABLE Diesels

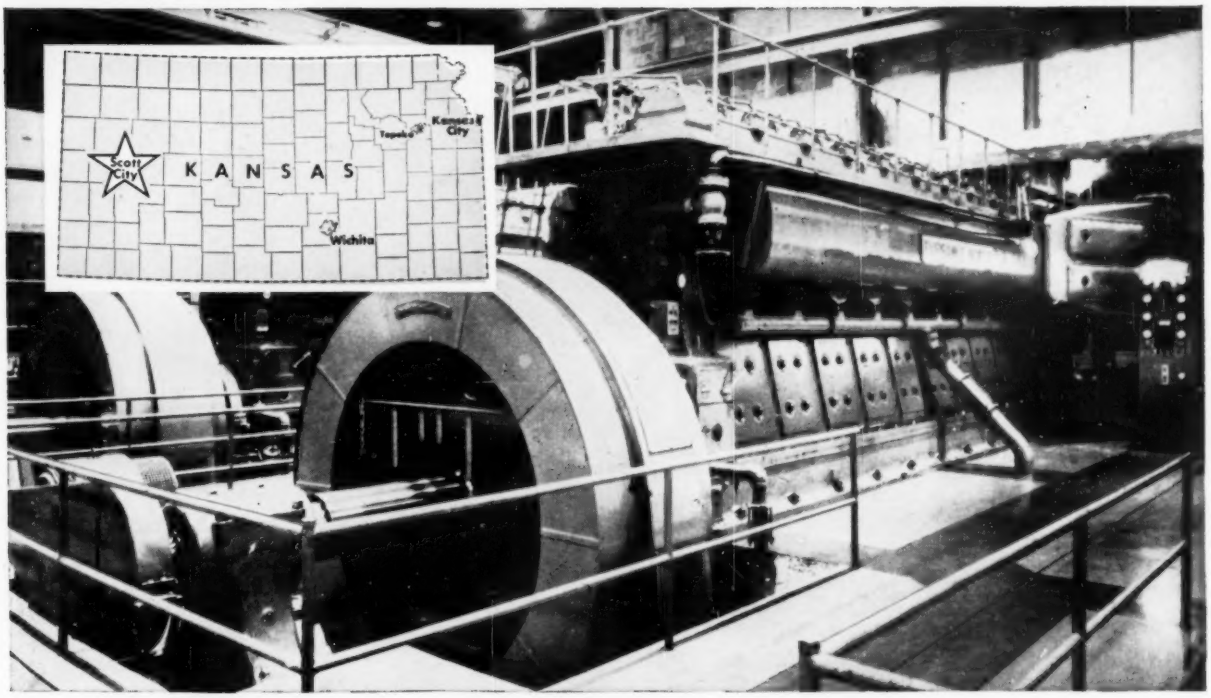
18th and Florida Streets
San Francisco 10, California

ENTERPRISE ENGINE & MACHINERY CO.

A Subsidiary of GENERAL METALS Corporation

Boston • Chicago • Denver • Kansas City • Los Angeles
Minneapolis • New Orleans • New York • San Diego
San Francisco • Seattle • St. Louis • Washington, D.C.

DIESEL ENGINES • OIL BURNERS • PROCESS MACHINERY

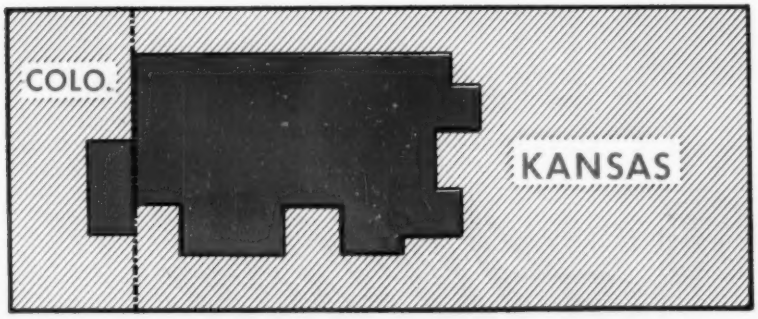


Largest REA Plant in Kansas Reports Cities Service DC-840 Diesel Oil Excellent!

Fairbanks-Morse Diesels of Wheatland Electric Cooperative, Inc. give outstanding performance using DC-840 Oil for power cylinder and crankcase lubrication. Here are the results Wheatland achieved:

1. House operation each unit—13,000 hours.
2. No oil changes due to oil failure.
3. No overhaul or major breakdown.
4. Rings free in groove with little or no signs of wear.
5. Oil consumption within mfgr's. recommendation.
6. Fuel consumption 10,572 BTU/KWH, load factor 63.7%.
7. Maintenance of lubricating oil at minimum expense.
8. 3500 H.P. hours per gallon of lubricating oil.
9. No wear on main or rod bearings.
10. No oil change at end of 9,000 hours.

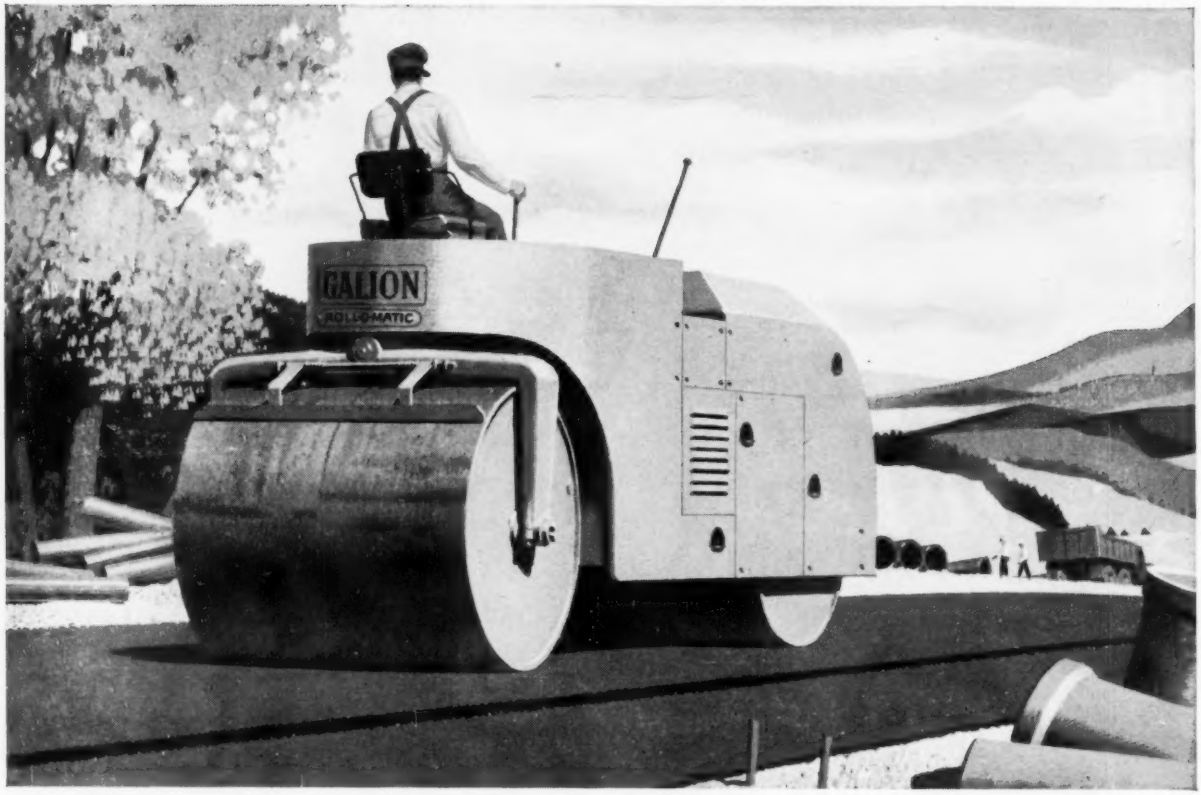
For similar results in your Diesel operation, contact your nearest Cities Service office or write to Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.



WHEATLAND ELECTRIC COOPERATIVE, INC. serves 3,300 square miles in all or part of Scott, Wichita, Hamilton, Greeley, Kearny, Wallace, Logan and Finney Counties in Kansas as well as sections of Kiowa and Prowers Counties in neighboring Colorado. Also supplies wholesale the Lane-Scott Cooperative serving 2,200 square miles in 6 Kansas Counties.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



NEW GALION ROLL-O-MATIC WITH TORQMATIC CONVERTER

rolls 10% more surface per day

GALION — one of the world's largest manufacturers of road rollers—now offers four new gasoline-powered ROLL-O-MATIC tandem rollers equipped with Allison TORQMATIC Converters.

This efficient combination torque converter and fluid coupling makes ROLL-O-MATIC simpler to operate. It eliminates the master clutch. There are no gears to shift.

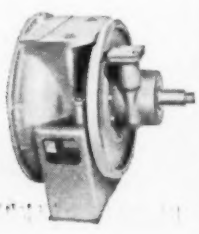
ROLL-O-MATIC rolls smoother in either direction. With the governor directly on the tailshaft it has quicker pickup —takes guesswork out of reversing. Rolling speed is automatically maintained up hill—on the level—down hill and on curves, by means of the combination of the TORQMATIC Converter and tailshaft governor.

The maker reports the operation is so smooth that at least 10% more surface can be rolled per day. And fuel consumption is reduced as much as 25%.

The applications of Allison TORQMATIC Converters are broadening rapidly. With units in a new range from 40 to 150 horsepower to fit both gasoline- or Diesel-powered engines, more than likely you, too, can gain the many moneysaving benefits of this drive. The completely *self-contained* converters are compact, easy to install and surprisingly low in price.

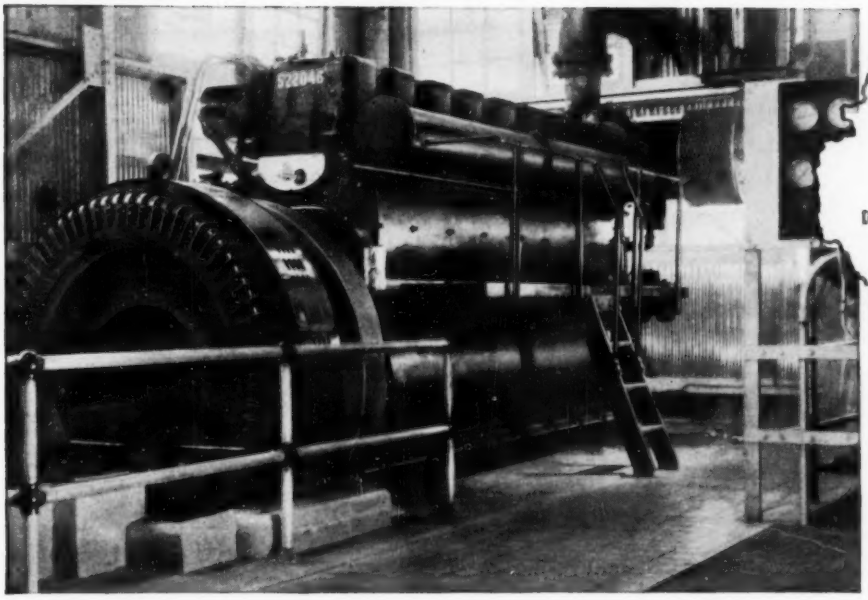
Check your equipment manufacturer or dealer or write us for full particulars.

ALLISON DIVISION OF GENERAL MOTORS
Box 894S, Indianapolis 6, Indiana



GM
GENERAL MOTORS

Allison
TORQMATIC DRIVES



this eight-cylinder, 1080-hp Alco Diesel Engine delivers dependable, round-the-clock power to a large bauxite mining center and its community.

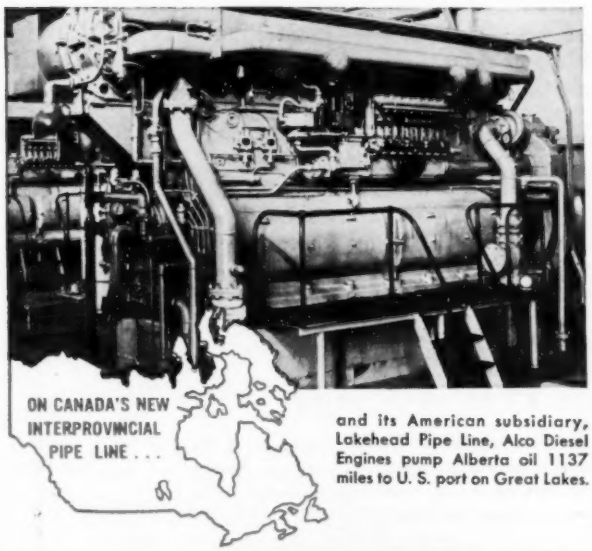
THE STORY GETS AROUND

Make a better product and the story gets around.

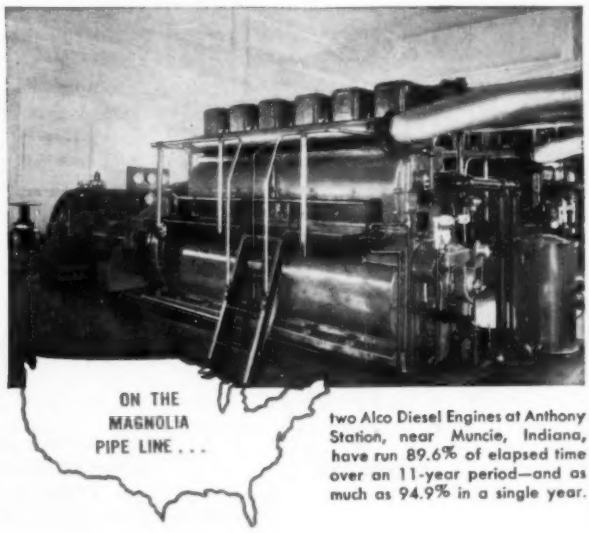
The story of Alco Diesel Engines, for example, has traveled around the entire world—right along with the engines themselves. High points in the story are:

- ☆ **COMPACT DESIGN—saves floor space, cuts construction costs.**
- ☆ **HIGH ENGINE EFFICIENCY—for lower fuel costs.**
- ☆ **FLEXIBLE POWER RANGE—for lower expansion costs.**
- ☆ **MEDIUM SPEED—for lower auxiliary equipment costs.**
- ☆ **HANDLES ANY TYPE OF JOB—continuous or standby, temporary or permanent.**

Your nearest Alco sales representative will be happy to give you complete details. (For information on the new, heavy-duty lightweight Model 251A, ask for Bulletin DE-2.) Sales offices in New York, Beaumont, Chicago, Cleveland, Houston, Kansas City, San Francisco, Schenectady and St. Louis.



and its American subsidiary, Lakehead Pipe Line, Alco Diesel Engines pump Alberta oil 1137 miles to U. S. port on Great Lakes.

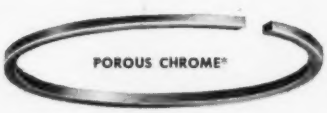


two Alco Diesel Engines at Anthony Station, near Muncie, Indiana, have run 89.6% of elapsed time over an 11-year period—and as much as 94.9% in a single year.

ALCO DIESELS

AMERICAN LOCOMOTIVE COMPANY

SCHENECTADY, N. Y.



Why these Koppers Piston Rings

give extra service

IT'S the materials used and the methods of manufacture that make for long piston ring service.

Koppers, with over 35 years of engineering and foundry experience, is highly qualified to combine the best of both metal and method. This experience assures you maximum service and satisfaction when you specify Koppers American Hammered Piston Rings.

Koppers engineering and research staff (which gave industry piston ring improvements such as K-Spun and Porous Chrome*) are also fully experienced in analyzing and solving problems. Koppers engineering service is ideally equipped to make recommendations for both original and replacement installations.

Similar leadership is evident in Koppers production facilities and manufacturing *"Know-how."* A large foundry equipped for both static and centrifugal castings, an up-to-date heat-treating plant, modern machine shops, an efficient testing laboratory and a complete piston ring research laboratory are Koppers physical assets. Its skilled manpower and production experts, with their widespread knowledge of the latest production techniques and practical experience in making industrial piston rings, make the products of engineering skill and manufacturing facilities an actuality . . . Koppers American Hammered Industrial Piston Rings.

American industry . . . aircraft, marine, commercial engine, railroad, petroleum, chemical . . . all benefit from this happy union. It gives them piston rings, made better to serve industry better. For help with your piston or sealing ring problems, consult Koppers first. Never any obligation. Write to: THE KOPPERS COMPANY, INC., *Piston Ring Dept.*, 1549 Hamburg Street, Baltimore 3, Maryland.

**Van der Horst Process*

KOPPERS®

AMERICAN HAMMERED
Industrial Piston Rings

METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC., BALTIMORE 3, MD.
This Koppers Division also supplies industry with Fast's Couplings, Koppers Electrostatic Precipitators, Aeromaster Fans, Gas Apparatus.
Engineered Products Sold with *Service*

NEW CATALOG TELLS . . .

WHAT YOU NEED TO KNOW ABOUT FLEXIBLE METAL HOSES FOR DIESEL INSTALLATIONS

Includes installation recommendations and engineering and fittings data. Free on request.

Describes types of American Flexible Metal Hose for marine and industrial diesel applications: exhaust, air intake, fuel oil, lubricating oil, starting air, circulating water.

Tells how your present and future needs can be readily taken care of with the many types of easy-to-install, long-lasting American Flexible Metal Hose such as: corrugated steel, interlocked steel, seamless bronze, etc. 54215

Mail coupon today for your free copy!

The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn.

Send me Bulletin EH-50, "Flexible Metal Hose By American for DIESEL ENGINE INSTALLATIONS."

NAME .....
(PLEASE PRINT)

COMPANY .....

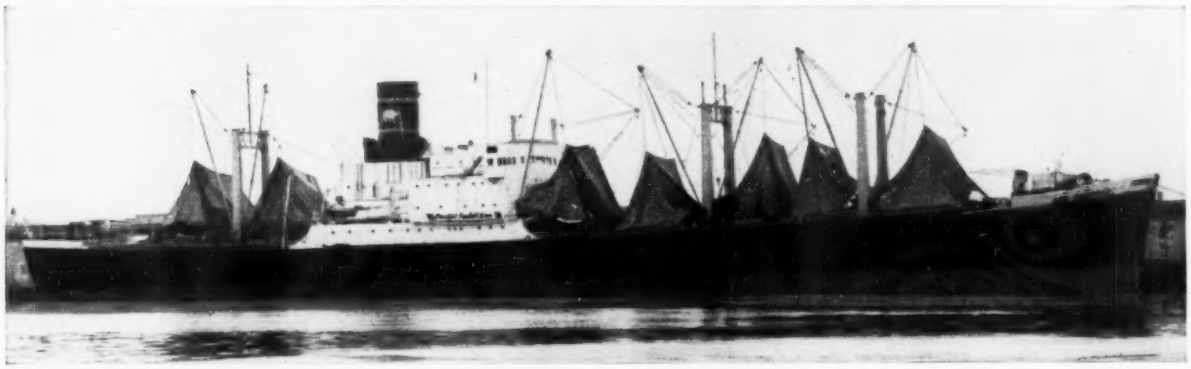
STREET .....

CITY..... ZONE..... STATE.....

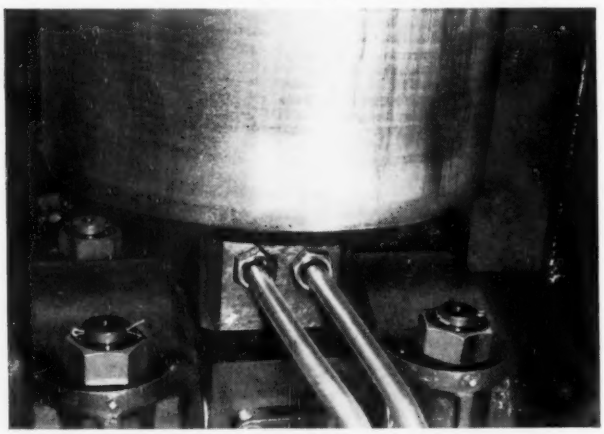
The Engineer's Report

CASE HISTORY
PRODUCT *RPM Delo Marine Lubricating Oil*
FIRM *Pacific Far East Lines, Inc, San Francisco*

New lubricating oil cuts costs on motorships!



RPM DELO Marine Lubricating Oil, a new detergent-type oil, lubricates the big Sun-Doxford diesel propulsion engines in Pacific Far East Line's M.V. Sea Serpent. Especially developed for cylinder and bearing lubrication in high-output, low-speed marine diesels, this special oil minimizes the problem of deposit formation in engines. It keeps them cleaner even where the heavier residual fuels are used. Special compounding in RPM DELO Marine Lubricating Oil inhibits engine deposits, helps keep lacquer off cylinder liners and reduces wear. Records from actual operations show that this oil can cut maintenance costs on big diesels up to 30% and greatly reduce oil consumption. RPM DELO Marine Lubricating Oil is available in viscosity grades SAE 30, 40 and 50.



AVAILABLE IN MANY PORTS. RPM DELO Marine Lubricating Oil is stocked for ship operators in all principal ports throughout the nation.

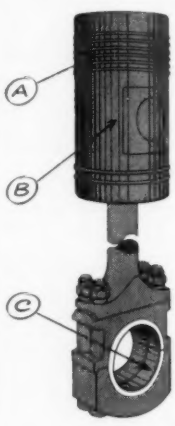
Standard Marine Fuel and Lubricant Engineers are stationed in the following ports: Seattle, Portland, San Francisco, Oakland, and Los Angeles Harbor area. They will give ship operators expert help at any time.

FOR MORE INFORMATION about RPM DELO Marine Lubricating Oil or other petroleum products, or the name of your nearest distributor, write or call any of the companies listed below.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

How RPM DELO Marine Lubricating Oil keeps engines clean and prevents wear



A. Highly effective compounding inhibits deposits...solves residual fuel carbon problems in low-speed marine diesels ...cleans dirty engines, keeps new engines clean, helps prevent scuffing.

B. Special anti-oxidant additive resists formation of lacquer and prevents ring-sticking. Film stays on parts whether hot or cold, running or idle.

C. Corrosion and foam inhibitors stop bearing corrosion, prevent foaming in wet or dry sump engines.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

Two CP Diesels Keep The "Follies" on Ice

Here's an example of CP performance and reliability—a pair of Chicago Pneumatic Model 68 diesel engines that generate over an estimated 1,000,000 kwh a year for The New Haven Arena. Besides furnishing light and power for the entire arena consisting of auditorium, parking garage, service station, ice plant, block of stores, and executive offices, they also drive two 10 x 10 ammonia compressors for the manufacture of commercial ice in the summer and refrigeration for rink ice skating in the winter.

Rated at 180 hp, 600 rpm, these engines are typical of many CP installations where multiple power requirements call for absolute dependability and low operating cost. CP diesel, dual-fuel and gas engines are available in sizes capable of delivering from 120 hp to 1750 hp. For more details write *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, New York.*

One of the two CP Model 68 diesel engines generating light and power for The New Haven Arena.

Chicago Pneumatic
PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

"7,125 men and women signed up to join those already saving for their financial security..."

GEORGE H. COPPERS

President,
National Biscuit Company

"There is no greater honor than partnership in an enterprise as important to a nation as the Payroll Savings Plan for United States Savings Bonds. We view our recent person-to-person canvass of employees in behalf of Bonds as practical patriotism. It supports our Government's efforts to stabilize the value of the dollar. The campaign also benefited our employees. 7,125 men and women signed up to join those already saving for their financial security in this easy, automatic way."

The Payroll Savings Plan is the backbone of Series E Bond Sales. 8,500,000 employees in more than 45,000 companies invest more than $160,000,000 in Savings Bonds *every* month.

The person-to-person canvass is the keystone of The Payroll Savings Plan. In company after company person-to-person canvasses *conducted* by *employees* have increased participation to 60%, 70%—even 90% plus.

Why don't *you* conduct a person-to-person canvass in *your* company? Here are two, simple steps:

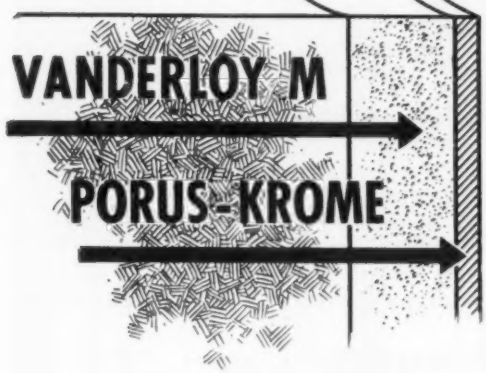
- Tell the Savings Bond Division, U.S. Treasury Department, Washington, D.C., you want to conduct a person-to-person canvass, they will show you how easy it is to install the plan.
- Over *your* signature tell your men and women you are 100% behind the Payroll Savings Plan because it enables them to build personal security . . . it is a check on inflation and helps to stabilize the dollar . . . it has set up a reservoir of reserve purchasing power—over $37.5 billion—the cash value of Savings Bonds held by individuals at the end of July, 1954. The greatest reserve of purchasing power this or any other country has ever had.

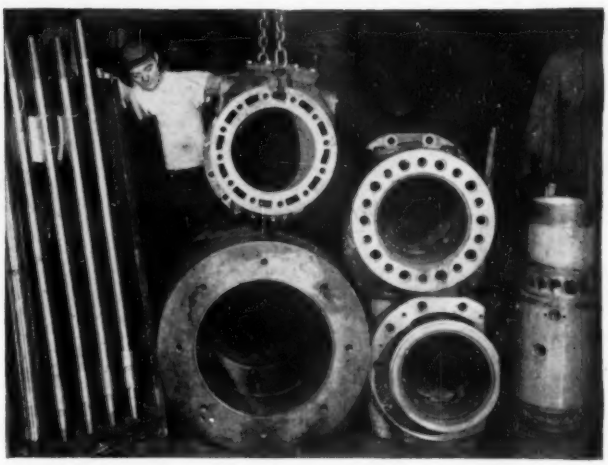
Your phone call, telegram or letter to Savings Bond Division, U.S. Treasury Department, Washington 25, D.C., will bring prompt co-operation from your State Savings Bond Director. Act today.

The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

DIESEL POWER

Reverse the Wear...





VAN DER HORST
TRADE MARK

* *PORUS-KROME is a dense, hard, wear and corrosion-resistant chromium, produced by the Van der Horst Corporation of America, and which gives working surfaces an infinite number of tiny oil-retaining reservoirs for perfected lubrication.*

U. S. PATENTS
2,048,578, 2,314,604 and 2,412,698

Why bother to have your liners oversized? Reverse the effects of wear — have your liners Van der Horst processed!

With VANDERLOY M we can plate back any liner you have to original size — and with PORUS-KROME* we can keep it that way.

A PORUS-KROME liner outwears as many as four unprocessed liners. Meantime, it uses less lube and fuel oil, delivers more power and is much easier on rings.

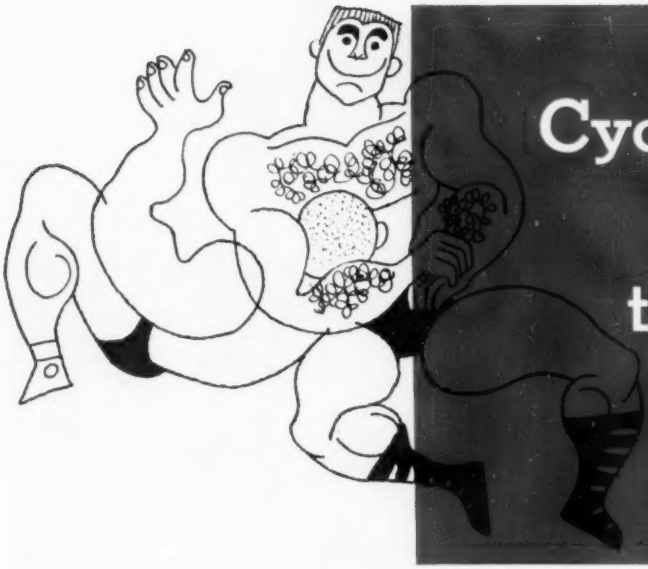
When such liners finally need replacing, simply slip in another set of Van der Horst Re-STANDARD-Sized liners — and send the worn ones back to us for renewal again.

Even liners you'd normally scrap are restored to original dimensions and each renewal pays pays for itself — several times over.

Of course the real profit comes when you eliminate the cost of stocking oversize parts — simply by having Van der Horst "reverse the wear" on all your liners. Let us show you how much can be saved by making this your standard practice.

W52-3D

VAN DER HORST CORPORATION • OLEAN, N. Y.



Cyclan resists wear far better than standard ring iron

No other piston ring material combines so many advantages as

Cyclan

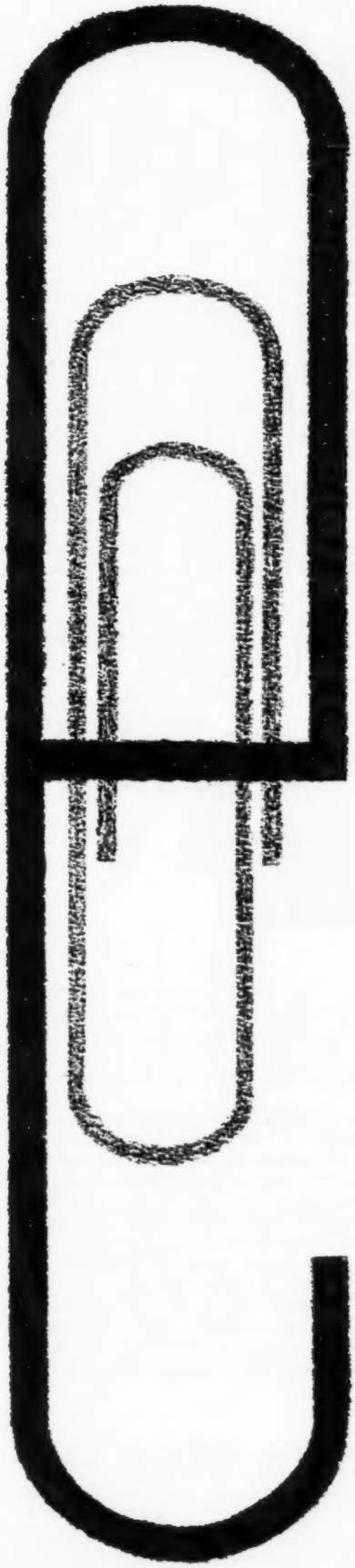
- Cyclan is Sealed Power's new alloy for extreme operating conditions.
- Cyclan's strength approaches that of steel.
- Cyclan's resilience exceeds that of cast iron.
- Cyclan retains the bearing characteristics of cast iron.
- Cyclan has extra high impact value for resisting shock.
- Cyclan rings retain their true shape even after considerable deflection.
- Cyclan piston rings are especially durable in super-charged engines.
- Cyclan can be readily chrome-plated, but functions efficiently without plating.
- Cyclan is available for original equipment rings in heavy duty engines.
- Some Sealed Power Cyclan Ring Sets are available for replacement use now. Others will follow soon.

Let our engineers tell you the Cyclan story!

SEALED POWER CORPORATION, MUSKEGON, MICHIGAN

Sealed Power

PISTON RINGS · PISTONS
CYLINDER SLEEVES

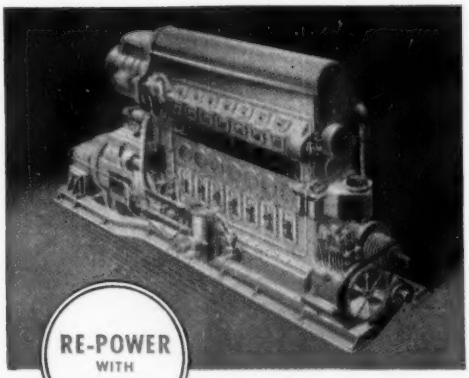


Shotgun or Rifle?

When you want to deliver an impact over a broad area, you use a shotgun. If you want to hit a narrower more definite target, you use a rifle. There is an analogy here with planning the impact area to be covered in a magazine, particularly one covering so broad a field as the diesel industry. Using the rifle technique to cover each engine, sometimes even components, in all applications would mean that a literal-minded reader would wait a long time for the impact to fall in his zone of interest. That's why we run many "shotgun" articles to assure that each issue contains payoff ideas for all. What brings this up? Simply that our letters would indicate that some readers apparently do not realize that our field has a common denominator—the diesel engine. Many principles apply regardless of engine size and use. Broad articles on lube oil, fuels, bearings, or any similar subject

ditorially speaking

have application pretty well across the board. Even if the text and pictures slant toward, say tractors, it does not follow that a truck engine man cannot learn something from it. We receive many letters asking for specific data. Of late, we have been trying to answer these by supplying tearsheets from recent issues—pretty successfully too. In one case, two articles published within four months of the letter's receipt covered the subject in detail. We'll bet that they were missed because they were not "tagged" specifically for the reader's usage category. If you are looking for a very specific rifle-type article to hit you dead center every month, you won't get it here or in any other magazine. But if you go through all the articles with the aim of picking up ideas that you can apply, perhaps with a little adaptation, you'll find the payoff in each issue. Give it a try, will you?



Model 38F Marine O-P Diesel for the 225 to 750 horsepower class.

"He's spending more time at sea, that's why we see him less these days . . . and all because of something called Re-Powered with O-P."

Yes, there is a lot of talk on shore these days about those boats that have been re-powered with the newest in marine diesel power —the Fairbanks-Morse Opposed-Piston engine in the 225 to 750 horsepower class.

For this engine was specifically designed for putting more power, more speed and more performance in your engine space when you re-power. How? This engine is a *completely* packaged marine unit with all accessories . . . lube oil cooler, filters, pumps, heat exchanger and attendant piping engine mounted. Add to this the inherent compact design of the O-P engine that is 20% less in length and width . . . weighs about 20 pounds per horsepower . . . and you see why the new Model 38F offers you more power, more speed, more performance—in less space than with any other diesel engine.

There are more facts on the 38F that will be of great interest to you—low maintenance, reliability and economy. Call your nearby Fairbanks-Morse Marine Specialist—you'll be glad you did when *you* start spending more time at sea. Fairbanks, Morse & Co., Chicago 5, Illinois.

FAIRBANKS-MORSE

a name worth remembering when you want the best

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAIL CARS • ELECTRICAL MACHINERY
PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

highlights

■ GM's Electro-Motive Division has developed unique treadmills that permit diesel locomotives to operate up to 50 mph at varying load and speed conditions without leaving the test building.

■ The Society for Experimental Stress Analysis will hold its annual meeting and exhibition at the Bellevue-Stratford Hotel, Philadelphia, Pennsylvania. The date—September 21-23, 1954.

■ "What's In It For Me" is the latest booklet from the National Safety Council. It is designed to show the skeptical worker what he stands to gain from working safely.

■ Every month new applications pour into the FPC for authorization of new pipelines for gas and/or oil transportation. In July, applications were more than one per day—more work for diesels both for constructing the lines and moving gas and oil.

■ Mr. Roy Fruehauf, president of the Fruehauf Trailer Co., recently predicted that Americans may some day travel across the country on rolling roads—super conveyor belts powered by the energy of the sun. He also predicted that there would be 1,000,000 trailers on the roads by 1960. This is about double the present number and indirectly means that more diesel-powered tractors will be needed.

■ A little over a year ago, Diesel Power reported on the use of diesel-powered fork lift trucks on the New York waterfront. At that time, stevedores were more than satisfied with the diesel's performance with one firm contemplating a complete dieselization program. Now it has been reported that diesel-powered units represent nearly 90% of the fork lift truck sales for this rugged application. The result has been that more fork lift manufacturers are offering diesel-powered models, a recent one being Hyster with a Perkins' engine under the hood.

■ EMD recently delivered 10 locomotive units to the East Bengal Railway of Pakistan. Reportedly, 15 more narrow-gauge locomotive units will be delivered in the near future.

■ Many railroads are planning the addition of mechanical refrigeration cars in an effort to get a larger share of the frozen food shipments. This means more diesels for the railroads.

■ During 1953, Class I railroads spent $300,219,000 for diesel fuel, an increase of more than $38 million compared with 1952. A reduction of expenditures for coal to the tune of more than $46 million was also reported.

■ At the end of 1953, the United States had 501,859 producing oilwells scattered through 28 states. Many of these wells produce both oil and gas. Diesels play an important part in the production and transportation of oil.

■ Important highlights of some of the recent developments in highway transportation will be presented to SAE's national transportation meeting. Sheraton Plaza Hotel in Boston is the place. The dates—October 18 to 20.

■ A high state of Russian development in internal combustion engine design is touted in a volume, "Internal Combustion Engines" by V. T. Tsvetkov. The British magazine Gas and Oil Power for July gives a lengthy and detailed report on this opus. They were not impressed. The first four pages are quoted as containing a list of "firsts" including the true development of the diesel. If these contain a grain of truth, the Czarist regime is to be congratulated since the "People's" government appears to have degenerated the art into cribbing and modifying long-established designs of the capitalist countries. For example, the Jaroslav factory JAS has reported a faithful copy of the GM-71.

Diesel Repairs on the PENNSY

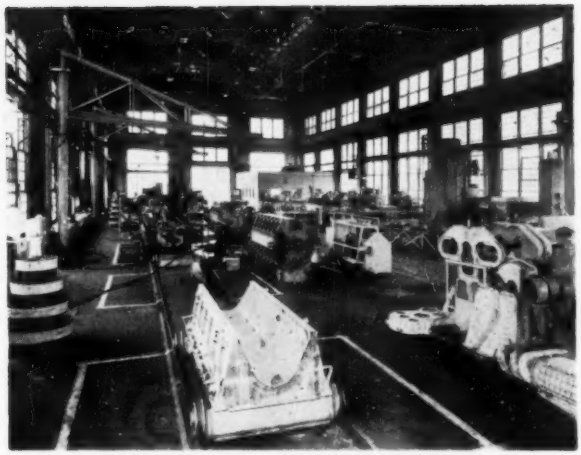
Rapid dieselization means equally rapid development of maintenance techniques and facilities. Personnel training in many new procedures must keep pace with other developments.

On the Pennsylvania Railroad all this was done as required to meet the needs of an expanding dieselization program. Facilities developed primarily for heavy repairs to diesel-electric units at Altoona, Pa., are outlined in some detail below.

DIESELIZATION on the Pennsylvania Railroad has proceeded rapidly during the last seven years. A relatively small number of diesel switchers, acquired during previous years, has grown to a fleet totaling 1984 diesel-electric units. These consist of 1127 switchers, 689 freight units, and 168 passenger units, normally operated as 1426 locomotives. All principal builders are represented in this equipment.

Terminal maintenance facilities have been provided by two new modern diesel shops, one for passenger, the other for freight units, both located in the Harrisburg, Pa. vicinity. Another smaller modern building was erected at Chicago, Ill. and equipped for trip inspection of passenger power, and maintenance of some switchers. In addition, modifications have been made to a portion of the steam locomotive repair shop at Columbus, Ohio, providing for diesel unit maintenance and repair work. In addition, other suitable facilities have been provided for maintenance work at more than 30 enginehouses on the system.

When it became necessary to make provision for heavy repairs, Altoona Works, logically was selected. Diesel unit repair work is centered largely at three locations in "The Works", reportedly the largest railroad shops in the world. These locations are the E & M (erecting and machine) shop, the Diesel Engine shop (both at Juniata), and the Diesel Electric shop, at 12th street, Altoona (1.9-miles apart).



Above, west end of the diesel engine shop. Room in back corner is for reconditioning and testing of governors and fuel injection equipment.

The shops alone, however, are not enough. In addition, there must be considerable thought given to scheduling maintenance operations if equipment is to be kept operating at peak efficiencies. This too has been done on the Pennsy.

The Maintenance Set-Up

Basically, maintenance is divided into four general categories: Scheduled Periodic High Maintenance, Scheduled Periodic Low Maintenance, Running Repairs —Heavy and Ordinary, and Periodic Inspections.

Scheduled Periodic High Maintenance—is due after service periods of 48 months for passenger, 72 months for freight, and 120 months for switching units. This is the only class of repairs which calls for the complete dismantling of the unit and its component parts.

Scheduled Periodic Low Maintenance—is due for road units between 18 and 24 months, depending upon the type of unit and kind of service. Usually one, two, or three low maintenance periods occur between high maintenance periods.

The only dismantling scheduled at this time is the removal of power assemblies for reconditioning, and of turbochargers for inspection, testing and any necessary repairs. On certain types of units, the main bearings are also examined. Other parts, found to be defective upon inspection are either repaired in place, or are replaced with a reconditioned part or assembly.

Heavy Running Repairs and Ordinary Running Repairs—consist mainly of those repairs which become necessary while a unit is in service, between scheduled maintenance periods, due to failure of a major part necessitating heavy repairs or something of a less major character requiring ordinary running repairs.

Periodic Inspections—are made on an annual, semi-annual, quarterly, monthly, semi-monthly, and trip basis. For each of these, there is an inspection sheet showing parts and assemblies to be inspected. Any defective components uncovered by these inspections are immediately corrected at the shop making the inspection, if practical. If it is not practical, the unit is sent to another point where work can be done.

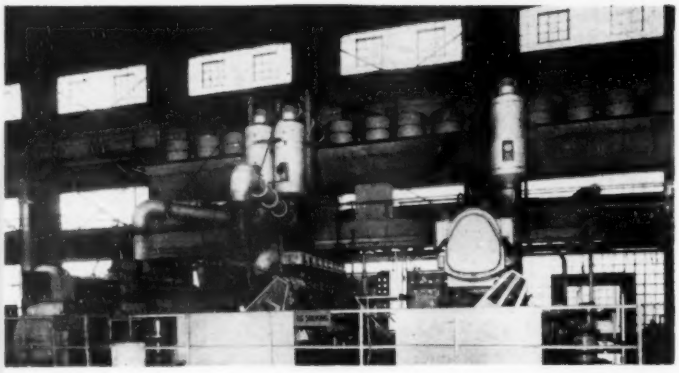
E & M Diesel Erecting Shop

Reportedly the largest railroad shop building in existence under one roof, the E & M shop measures 344 ft by 688 ft. It was built about 1924 for the heavy repair of steam locomotives with an intended capacity of 150 locomotives per month. This is a transverse-type shop with a 27-track, 85-ft wide erecting bay extending the length of the building on each side. There are also two center bays, each 85-ft wide. The latter are used for the repair of parts and assemblies. The east erecting bay is used exclusively for diesel unit repairs, as is about one-third of the west erecting bay.

In order to comprehend the rather varied nature of work performed in this diesel erecting shop, it is necessary to keep in mind the various classifications of work already outlined. A typical month's output may total 100 to 115 units, with all classes of maintenance and repairs represented. Over a majority are likely to be running repairs—about equally divided between heavy and ordinary; of the remainder, over one-half probably will receive scheduled periodic maintenance—high and low; the rest will be periodic inspections. An additional 100 or so periodic inspections of mountain helper and switcher units, are made in a normal month, in a diesel enginehouse, near E & M shop, under the same supervision.

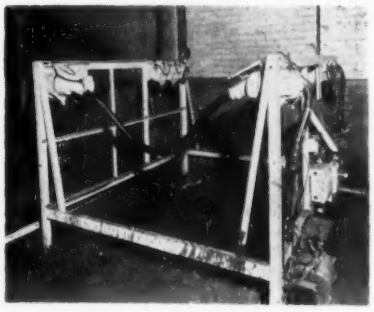
Shop operations include work ranging from complete unit overhaul to the removal, repair and replacement of one or more component assemblies. These operations are performed as scheduled or otherwise necessary. Additional work accrues from the various preventive maintenance inspections and running repairs.

Three fixed 2-level platforms have been installed to serve six tracks in the erecting bay. One platform is at engineroom floor level, and the other at unit roof level, with stairways from shop floor to upper levels. Since roof hatches, engines, main generators, and steam generators can be removed by cranes from units standing on any track in erecting bay, the platforms are used primarily for pulling power assemblies, turbochargers and the like. In addition they add a large increment of convenience and safety for men working in and above engineroom.



Engine test stands in the diesel engine shop. Here, three engines of the same or different makes can be accommodated at one time.

Below, the jumper cable rack, developed and built at the diesel electric shop. There are sockets for five different kinds of control cable jumpers.



Upon removal of parts and assemblies from a locomotive unit, they are moved to designated shops for repair or rebuilding. Engines and power assemblies go to the diesel engine shop; generators, traction motors (if mileage run limit has been reached, or if repairs are required otherwise), and other electrical equipment are routed to the diesel electrical shop, at 12th street. Some parts go to closeby machine, welding, and airbrake shop, while some parts do not leave the E & M shop since they are reconditioned in the center bays. Still other parts go to their respective repair shops within the Works. Those parts which remain attached to car body are inspected and repaired in place.

Diesel Engine Shop

Formerly, this was a machine shop for heavy steam locomotive parts and only about half its present 83-by 581-ft size. The coming of the diesel, however, necessitated the expansion of this shop and a new section with glass block walls was added.

Engines entering the shop are placed on portable racks and dismantled. As this phase of overhaul proceeds, the parts are placed in racks and other containers for removal to the cleaning vats. Once cleaned, parts are thoroughly inspected and subjected to magnetic testing where necessary.

Wear on the liner pilot supports and bearing supports is compensated for by welding and remachining to standard sizes. Cracked cylinder heads are also repaired by welding and machining. Valve seats are ground and the valves Zyglo-tested for cracks.

Excessive wear in piston pin bores of EMD piston carriers is corrected by renewing the piston pin carrier bushing. Top ring groove wear is generally corrected by machining wider ring grooves in the piston. On some aluminum pistons, however, the ring lands are machined off and new ring carriers shrunk on or the piston is built up solid with weld material and new ring grooves are then cut in the piston. Accumulated carbon on the underside of piston crowns is removed by abrasive grit blasting except in cases where cooling coils are used. The latter are cleaned by use of a carbon solvent. A special adapter, fitted into one side on the piston pin bore, facilitates pressure-testing of oil cooling coils.

If cylinder liner wear exceeds 0.017 in, liners are sent to an outside shop to be built up and chrome-plated. Liners not worn in excess of 0.017 in are returned to service.

A magnetic test is employed in checking for crankshaft defects. Where necessary, crankshafts are reground and a Spray Bond method used to restore crankshafts to standard sizes. Although there are 29 engines presently in service which have been repaired in this manner, this system, however, is still in the experimental stages.

Connecting rods are checked for elongation, twist or bend, bore alignment, and other defects such as cracks. Here again a magnetic test is employed.

Fuel injection equipment and engine governors go to a glass-enclosed, air-filtered room which is located in one corner of the shop. Here fuel pumps are overhauled and calibrated in accordance with manufacturers' specifications and approximately 1750 injectors processed each month. Equipment in the injection and governor room includes injector test stands, pump calibrating stand, governor test stands, and high speed lapping lathes.

Engine reassembly is handled on a production line basis with assembly beginning when the bedplate is placed on the assembly line. The assembly line consists of a track and sufficient dollies to afford nine stations. In addition, a fixed, crankcase roll-over device has been installed at one station to facilitate the installation of the crankshaft.

The production line method, however, can only be used when 50 or more engines per month are being overhauled. When a lesser number of units per month are being overhauled, the different make engines create a problem in the distribution of parts to the nine stations. When such is the case, assembly is accomplished at one or two stations.

When completely reassembled, engines are sent to an adjacent test rack and run in under simulated load conditions. The test rack is equipped to handle three engines of different make simultaneously. All necessary operating controls, cooling equipment, grid resistors, and instrumentation are included.

One stand on the test rack is equipped with a permanently installed generator for the testing of any size EMD engines. Those engines having direct-connected, engine-base-supported generators are tested on the other two stands. These are Baldwin-Lima-Hamilton, Alco, and Fairbanks-Morse engines.

After the engine is mounted and all connections made, the engine is started and run at idle for short periods of 5, 10, and 15 minutes. Following these "feeling out" periods, the engine is loaded and run at Throttle Position 2 for 10 min and then at Throttle Position 3 for 20 min. During this time, all pressures and temperatures are noted and inspections made for hot bearings, water leaks, or any other improper condition.

When the engine has been thoroughly checked and found to be in good order, the throttle is gradually advanced from Position 3 to 8. Each throttle position is held long enough to permit speed and load to level off and speed to be noted.

After full load and full throttle are reached and satisfactory performance attained, the engine is run in for a 4-hr period. A complete set of readings is recorded at idle and for each throttle position. In addition, readings are also taken at 30-min intervals during the 4-hr run in period. Upon completion of the test, engines are painted and returned to the E & M shop for installation in a unit or storage for future replacement.

Diesel Electric Shop

Altoona's diesel electric shop was formerly a locomotive tender repair shop. It has been converted by degrees, however, for the maintenance of diesel locomotive electrical gear. It is a 3-story building measuring 64 ft by 268 ft. Traction motor and generator repair were at first handled on the second floor of this building, but rapid dieselization has extended this entire field of operation until at present the entire building is used solely for the repair of diesel locomotive electrical equipment.

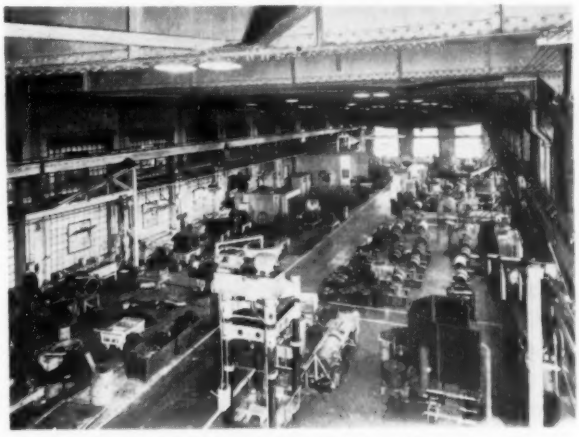
On the first floor, work in the electrical shop consists mainly of disassembly, cleaning, and later assembly of generators and traction motors. Generators, with the exception of the armatures, are reworked here. Cleaning is effected by the use of a vapor-degreaser and by blasting parts with a dry absorbent material.

After cleaning, parts and assemblies are routed to respective floors to be reconditioned. Generator armatures go to the second floor as do the traction motors. Here, field coils are given a high-potential test and replaced as necessary. Armatures receive a check on a surge comparison tester for grounds, shorts or open circuits due to defective insulation.

Production line techniques are used here also in the rewinding of armatures. This is accomplished by the use of special shop trucks which hold the armatures about waist-high and move along through various phases of rewinding. Included in this line are three infra-red furnaces. These are arranged to permit the softening of armature insulation which facilitates coil installation. The heating also aids in soldering coils in the commutator riser slots. Following this, they are impregnated with varnish for insulation, and balanced.

The third floor is used for the testing and reconditioning of a variety of electrical equipment found on a diesel-electric locomotive. This equipment includes auxiliary generators, exciters, contactors, relays, switches, and so forth.

To facilitate the testing and repair of this equipment, shop forces have designed and constructed several test racks. An example is the one for testing jumper cables which contain as many as 27 wires. Cables to be tested are plugged into the front and back frames of the rack, permitting a sag in the cable which corresponds to that of actual service. Operation of a selective switch on the panel enables the inspector to test each conductor separately by applying up to 100 amperes. Defects are indicated by tell-tale indicating lamps on the panel. When a break is discovered, a cut is made through the rubber sheathing and the break repaired. The cut is then vulcanized.



View of the traction motor shop located at the 12th Street diesel electric shop in Altoona.

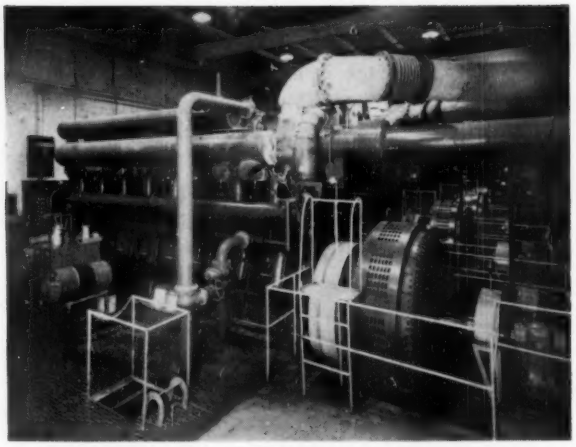
Summarizing

In summing up, it might be well to point out that the Altoona facilities outlined above have been developed in a relatively short space of time—about four years. This has taken careful planning and scheduling of maintenance operations, as well as the cooperative efforts of both management and the men in the shop. Now, with the basis of a firm maintenance program, repair facilities can easily be expanded as additional diesel-electric locomotives are added to the fleet as equipment grows older.

Oskaloosa Plans for Power

BY EVAN E. ROWE
Superintendent of Generation & Distribution, Oskaloosa, Iowa
District of Iowa Power and Light Company, Des Moines, Iowa

Experience of a private utility with heavy-duty dual-fuel engines.



Generator-end view of the four 1160-kw dual-fuel Worthington engines compactly installed at Oskaloosa, Iowa.

OVER the past 20 odd years the internal combustion engine has been a major consideration for power generation. During this time most Midwest private utility companies have had some experience with this form of prime mover.

Iowa Power & Light, however, was an exception until 1944 when it acquired the Iowa properties of the Iowa-Nebraska Power Company, which included two internal combustion engine plants. Experience gained in the operation of these plants served as a basis for thinking when it came to expanding the Oskaloosa facilities.

The Oskaloosa district lies some 60-mi south and east of our headquarters and main generating facilities in Des Moines. It has been served for the past 30 years by a 69-kv aluminum strand power line with a practical rating of not more than 10,000 kva.

Normal load growth in this area coupled with obsolescence and partial deterioration of this line, however, kept service there below the company's usual standards. In addition, a neighboring utility whose future sections were not definite, was being fed on a peak and emergency basis.

Iowa Power also serves the city of Oskaloosa with natural gas from the Natural Gas Pipeline Company of America with a station on their main line approximately four miles north of town. In addition, the district is responsible for dispatching natural gas to four other properties along this same line. Thus considerable gas was available during the warm weather portion of the year as "valley" gas on which our company has paid a demand charge established by the winter house heating peaks.

More Power

In the fall of 1947 an investigation of dual-fuel engines was started. Worthington's success with their Twin Six 20-in bore by 25-in stroke units at Red Oak, Iowa over the previous 11 years and 60,000 hours gave them a well earned advantage when the choice of the new units came up.

The last previous full time generating facilities in our town were abandoned in 1926. These consisted of reciprocating steam engines operating at 150 psig. The old boiler room at this plant was chosen with some misgivings as the location for the four new Worthington 1160-kw dual-fuel diesel engines. These were to be 16-in bore by 20-in stroke 8-cyl units operating at 350 rpm. This old boiler room, incidentally, has inside measurements of only 37-ft wide by 80-ft long by 30-ft from the buildings footings to the roof beams.

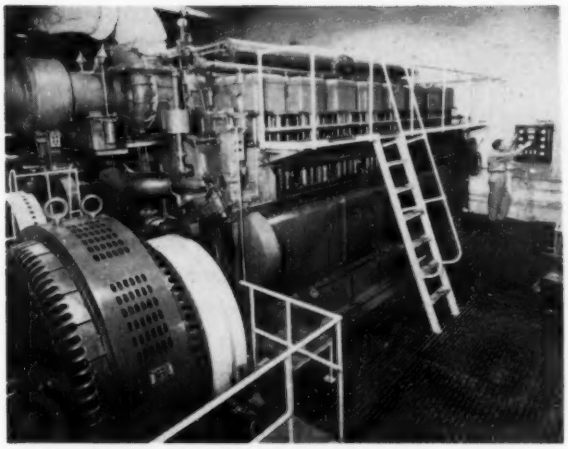
During the design and construction of the generating station, many interesting and temporarily bothersome problems were encountered.

Before foundation excavating was completed after the old boiler foundations had been removed, we found our hillside location to be adversely blessed with a peculiar clay which was extremely shifty when wet and crumbled badly when dry. As there was also a heavy flow of water through the foundation area a hurried conference with Worthington led to the decision to incorporate a concrete mat, 31-ft wide, 64-ft long and 2-ft thick, under the four foundations.

Engine piers were poured on top of this mat and tied in with reinforcing rods. Engines are spaced 14 ft, 9 in between shaft centerlines. Also included in the 78-ft operating space are evaporative coolers for lube oil cooling plus the jacket water pumps.

As all units would undoubtedly run steadily during the warmer months when gas was readily available and would just as likely be used for peaking during the cold weather, the possibility of the cooling system freezing gave us some concern. Worthington proposed to supply one 4000-gal below-ground hot-well into which all radiators would drain when the units were shut down in cold weather.

However, upon excavating the fourth radiator founda-



Operating side. Control panel is wall-mounted adjacent to the operating end of the engines. Note well-kept appearance.

tion, a forgotten hot-well used in the old steam plant was uncovered. This proved to be in moderately good shape and of 13,850-gal capacity. Plans were rapidly revised and the hot-well reworked and incorporated into the cooling water system.

Operating Problems

Water—After the plant was started it was found impractical to drain the radiators into the hot-well for a number of reasons. First, the operating crew invariably filled the hot-well to overflowing, making it necessary to pump out considerable water when radiators were to be drained. Second, we were having trouble finding reliable air bleeds to let air into the radiators and water out.

During the first winter of operation it was found that the plant could be shut down on a Friday night with a full hot well at approximately 160°F; and with one jacket water pump running and the automatic louvres on the radiators closed, the hot-well would still be above 70°F on the following Monday morning.

Air—The logical side of the building from which to take inlet air was not ideal since the engine room floor line is somewhat below the surrounding terrain. Instead, air is taken from a valley between the exterior engine room wall and a 15-ft railroad embankment.

This is the south side of the building where we get the heat of the sun and is the only logical location for the exhaust silencers and jacket water radiators. The fact that no trouble has been encountered because of a supposedly hot intake air condition is no doubt due to the large amount of air induced into this "valley" by the radiator fans.

Because the space between engine piers are rather shallow, day tanks were placed on the south side of the building along with the air intake, exhaust system, and jacket water cooling radiators. Although we anticipated some trouble from cold fuel oil in winter operation, none materialized.

Space limitations on the property necessitated the purchase of a small tract of land between two railroad spurs as a location for five fuel oil storage tanks. These tanks are second hand manufactured-gas receivers good for 150 psi, each having 14,000-gal capacity. These had accumulated a mixture of coal gas, tar, and other strange deposits over the years and were difficult to clean. The filtering systems, however, proved adequate for our needs.

Some Results

Our four and one-half years of operation have more than justified the decision to go into this type of generation.

These engines normally operate each day except Saturday and Sunday from 7 am until at least 10 pm unless weather affects the incoming transmission line. Units are usually run at full load or cut entirely off the line.

Fuel economy as tabulated below has bettered the manufacturer's guarantee by about 3½%. Lubricating oil consumption has been only about one-third of suggest consumption or approximately 12,000 hp-hr per gal. During those months when gas is continually available, we show pilot oil consumptions of approximately 4.3% of full load LHV Btu even though the units are started and stopped each day.

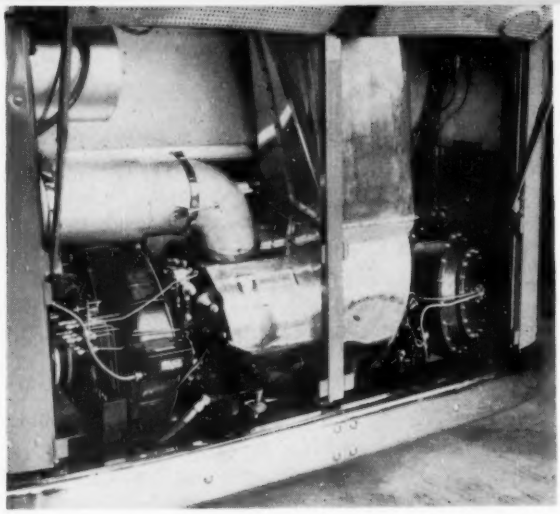
Each engine recently passed the 25,000-hr mark and no piston rings have been changed. At the last inspection each piston ring had near to its normal tension. Maximum radial wear on the top two rings was found to be less than .010 in and there was less than .005-in maximum liner wear. In a report to our management after this inspection, we estimated that these machines should last indefinitely barring accidents and with only normal care.

Power Pool and Bonus

In 1949 just prior to the time these units started operation, our company joined the first Iowa "Power Pool". One of the pool's functions is to select the units of the three participating companies that will carry base loads and peaks in the most economical manner. Although the pool consists of over ½ million kw, the 4640 kw in these dual-fuel engines is always selected because they are known as the lowest cost producers available in the pool.

Our transmission line from Des Moines is loaded over peaks to such an extent that the 69,000 v fed into Des Moines often reaches Oskaloosa at 61,000 v. However, since the addition of these engines, 69,000 v can be maintained over these peak loads with a resulting bonus. From the 4640 kw generated into the system, approximately 6000 kw results due to power factor correction and consequent maintenance of voltage. As of this writing, we have generated over 100,000,000 kw hr.

Each year we are required by the power pool to put out our maximum capability for at least three hours. We have consistently turned in a 3-hr record of over 5200 kw per hr, 12% above the full load rating.



A close-up (above) of the GT-300 Whirlfire engine installed in the Turbocruiser coach. As can be seen below, the turbocruiser differs little from the standard GMC transit bus.

(Photos courtesy SAE)

Gas Turbines

Considerable research and development is currently being carried on by numerous manufacturers seeking to suit the gas turbine for all sorts of jobs. Current technical papers tell of the gas turbine being tried in varied cycle arrangements and applications.

Boeing Aircraft has been experimenting with a gas turbine-powered over-the-road truck for a number of years. Early this year GM unveiled the Firebird, which incidentally was reportedly the first gas-turbine-powered automobile to be built and tested in the U. S. Several British firms have been experimenting with gas turbines for marine propulsion

GM Turbocruiser—A Mobile Laboratory

A RECENT development in the automotive gas turbine field was the Turbocruiser, a gas turbine-powered bus. This is the first of its kind in the world, according to GM research engineers who built the unit on the assumption that if the gas turbine eventually enters the ground transportation field, it is likely to appear first in heavy-duty commercial vehicles.

The Turbocruiser is a GMC transit coach in which the conventional diesel engine has been replaced by a GM Model GT-300 Whirlfire Turbo-Power unit. This is a single-burner prototype of the 370-hp twin-burner gas turbine used to power GM's Firebird.

From all outward appearances, the Turbocruiser is similar to any other transit bus with the exception of the large exhaust stack in the center of the rear deck and the absence of rear windows. Inside, however, it is equipped as a mobile laboratory having virtually all the instrumentation of a conventional test cell mounted on a large panel at the rear. With this arrangement, two engineering observers can sit in front of the panel and record data wherever or whenever the Turbocruiser rolls.

Driver's controls are typical of a conventional diesel-powered bus except for an additional cluster of instrument dials at the driver's right. The gas turbine consists of two mechanically independent sections, a gasifier and a power section. The gasifier provides a source of hot gas while the power section delivers the available energy from the gas to the rear wheels.

The Whirlfire engines were built as research tools with which GM engineers hope to isolate basic design problems. Therefore design of these first engines emphasized mechanical simplicity and reliability.

To conform with the research tool concept, the engines have been operated at relatively moderate turbine temperature and without regenerators. As a result, their fuel consumption is higher than the optimum which could be achieved.

Mr. William A. Turunen of GM Research Laboratories, while recently addressing the Society of Automotive Engineers on the subject, explained however that fuel consumption greater than that of piston engines was an anticipated disadvantage. Improving component efficiencies, reducing pressure losses, raising operating temperatures, and using a regenerator, are all cited as well as recognized approaches to reducing a turbine's appetite for fuel.

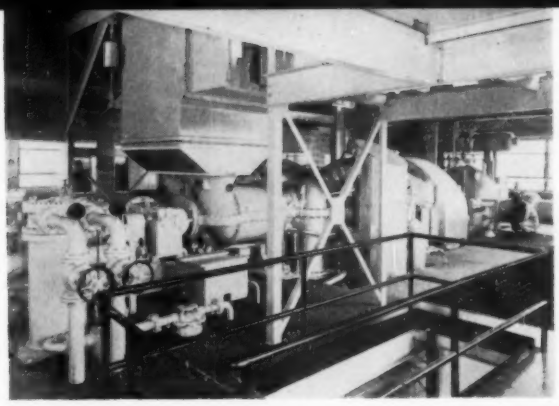
Such problems as high operating temperatures, air consumption, large quantities of exhaust gas, engine controls, noise levels, high speed rotation, durability, maintenance and starting, proved less bothersome and less formidable than GM engineers had anticipated before either the Firebird or Turbocruiser was road tested, Mr. Turunen revealed. Experience with these engines has confirmed, however, that such characteristics as high fuel consumption, lack of engine braking, and delayed acceleration must be improved before gas turbines can compete with present automotive power plants, he said.

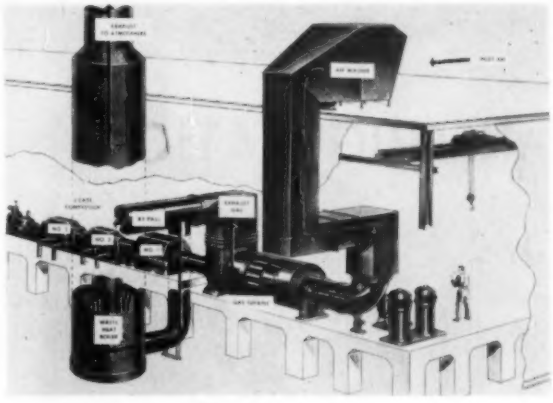
in the News

units, portable pumping units, and automotive power.

Still another unit for mobile applications such as starting jet aircraft has been developed by Solar. Gas turbine-electric locomotives are already in operation on some of our railroads. Packard and Chrysler are also to be included since these companies are currently experimenting with gas turbine power as applied to motor vehicle propulsion.

To indicate some of the progress in gas turbine research, we have selected two widely separated and different applications currently under study by research departments of two firms.





Above, interior view of natural gas pumping station showing GE gas turbine driving compressors at Napoleonville, La., Station of United Gas Pipeline Co. Below, artist's rendering of gas turbine compressor plant.

GE's Research with Larger Units

While predicting increased use of gas turbines in the gas and petroleum industry recently, a GE engineer cited some of the company's progress. Mr. E. C. Clark, GE Apparatus Sales Division engineer, pointed out that much experience and technological know-how has been gained on the part of the gas turbine department and its customers.

An example of such engineering progress is indicated by the increase in various turbine ratings. Originally rated 3500 kw or 5000 hp for simple and regenerative-type gas turbines, ratings have increased to 5000 kw or 7000 hp for the simple cycle units and 4750 kw or 6700 hp for the regenerative cycle units. These increases are the direct result of improved design and are realized without sacrificing reliability or quality, he said.

He noted that newer GE models have been improved further from an installation standpoint by factory-mounting the turbines on steel bases, shipping the units with factory-assembled piping, oil tank, and wiring. This enables the base to become a permanent part of the foundation, thus reducing the overall project costs.

The combustion gas turbine is a self-contained prime mover and as such it is suitable for installation in isolated locations as well as interconnected systems, Mr. Clark said. As an additional stimulus to its greater use, he emphasized the versatility of the equipment, listing its characteristics of simplicity, quick starting, minimum requirements for cooling water, and increased output with low ambient conditions.

July of this year marked the fifth anniversary of GE's pioneering application of the gas turbine for electric power generation, according to Mr. Clark. Today, he said, 38 units are being used to drive centrifugal compressors in the natural gas pipeline industry; 10 are being installed for repressuring oil fields; and one unit is operating in the petrochemical industry as a compressor drive for a large processing unit. Many others have been used in central station and industrial power plants and as locomotive drives.

The 28 GE gas turbines in operation on the El Paso Natural Gas Company's system represent the first large-scale application of gas turbines for pipeline pumping. Immediate observations indicated, and were later verified that gas turbine compressor stations could pump considerably more gas than they were designed to handle.

First of the El Paso turbines went into operation on September 29, 1952. By the end of 1953, the 28 units had accumulated over 100,000 turbine-hours of operation. At the present time, operating experience of these units is accumulating at the rate of approximately 15,000 turbine-hours a month.

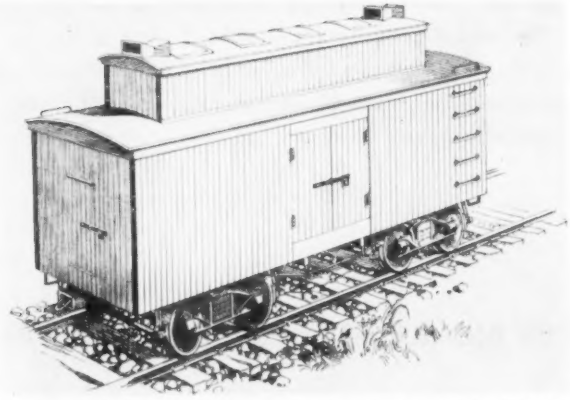
Mr. Clark reported that other companies now using GE gas turbines for natural gas pumping include: Southern Counties and Southern California Gas Co., California; Atlantic Seaboard Corp. Seneca Station, West Virginia; United Gas Pipe Line Company, Napoleonville Station, Louisiana; and Northern Natural Gas Co., Tescott and Macksville Stations, Kansas.

Refrigerator box in which strawberries were shipped in 1866 from Cobden, Illinois, to Chicago.

Here is a story of the development of one phase of mechanical refrigeration—reefer cars. Development details are given to exemplify one segment of an advance on the broad front comprising the mechanical refrigeration of food products. Deep freezing at the growing site, warehousing, and transportation of all types are further fields for exploitation. Whether for primary power or as standbys for insured protection diesels have no peer as the most economical and dependable source of power.

REFRIGERATION— *an EXPANDING Market for Diesels*

by M. O. Waugh



First practical refrigerator car was the "Tiffany Car" of 1880.

WHEN you sip your orange juice concentrate each morning you can thank—among other things—*the modern diesel engine*. Likewise frozen chickens, meat pies, french fries, and frozen cherries and strawberries, come to you most often these days, "courtesy of the diesel".

For the other side of the picture, if you happen to be visiting in Alexandria, Virginia, just down the Potomac river from Washington, D.C., you can glimpse the vast car shops of the Fruit Growers Express Company just south of Duke St. Here one of the newest projects of the refrigeration industry is well underway—the production of mechanically refrigerated freight cars, on an assembly line basis.

This year, four per day have steadily been coming off this line, bringing the Fruit Growers Express, Burlington Refrigerator Express, and Western Fruit Express total of "reefer" cars in August to 447, with another 160 on order for the first quarter of 1955—each car equipped with a modern diesel engine. And the end is not yet in sight! Only by a glance back into the history of freight refrigeration is it possible to imagine the possibilities of the future as the demand for a wise variety of frozen products grows, from coast to coast, with postwar momentum.

The Dream Goes Back to 1851

It was in 1851 that a wooden box car, insulated with sawdust, carried 8 tons of butter packed with ice from Ogdensburg, New York, to Boston. In 1857, under the direction of W. W. Chandler, the earlier model was improved. His string of 30 cars were lined and the air spaces filled with sawdust. There were ice boxes in the doorways and holes in the floors to carry off the water. Even later, ice boxes were slung up on iron straps at the ends of these experimental refrigerator cars.

In 1866 Parker Earle tried his hand at shipping strawberries from Cobden, Ill., in 12 large refrigerator chests, each carrying 200 quart baskets and packed with 100 pounds of ice. In 1867, Mr. J. B. Sutherland of Detroit took out the first refrigerator car patent. In 1868, William Davis, also of Detroit, took out another patent. The latter's car carried a galvanized iron ice tank parallel to the sides of the freight car, and was cooled by a combination of ice and salt put into the tank through the roof of the car.

By 1870, another idea had turned up: The "Tiffany Car" developed along lines of the Davis car, had a carrying capacity of 3000 lb of ice in bunkers hung from the roof of the car in a V-shaped sling. A Mr. Hammond of Detroit seems to have had the first ideas for a meat, fish, and poultry car, which was later improved by the Eastman Automatic Refrigerator Car Company of Boston so that the first shipment of dressed beef rolled out of Sioux City, Iowa in October 1891 and arrived in Boston seven full days later, without re-icing.

Phillip Armour Sells the Idea

Still a year when fruits and vegetables grew in home gardens and in the home-supplying gardens of the nation's farms was 1890. Only the nearby markets could be served. In that year, Mr. Phillip D. Armour, head of Armour Packing Co., became interested in the possibilities of shipping fruit from the sources to distant markets.

His sales idea was to build 1000 cars and send salesmen out to demonstrate the cars and secure his sources of supplies. As history records, his traffic business grew. He built more cars and soon became the "leading" company in this important and developing field of American progress. But still there was not as yet a *standard* refrigerator car.

The first *standardized* car came as the result of tests by the U.S. Department of Agriculture around 1918. It had an all-steel underframe, but walls and roof were of wood. Insulation 2-in thick was required in floor and walls with 2½ in of insulation in the roof.

Refrigeration—Big Business

By 1926, a number of railroad-owned car lines had been organized—Fruit Growers Express in 1920, Western Fruit Express in 1923, and Burlington Refrigerator Express in 1926. These companies recognized the fact that the handling of perishable crops was seasonal and that by working the supply-and-control of refrigerator cars from a central point, efficiency of distribution could be stepped up. Other railroad-owned or controlled car lines are Pacific Fruit Express, San Francisco and American Refrigerator Line, Chicago. In the West, the Atchison, Topeka & Santa Fe and other railroads own their own cars.

Two Wars Later and The Diesel

Although materials were scarce during World War II, Fruit Growers Express Company continued to pioneer towards a supermodern refrigerator car. Stemming from exhaustive tests of nine different refrigerator car designs and methods of mechanical refrigeration and in cooperation with G M's Frigidaire Division, plans for the "all purpose" car went forward.

Experiments as early as 1931 had pointed to the practicality of the diesel engine as part of the mechanism of the new model car. Experiments of 1946-48 confirmed the earlier indications with the result that the modern cars now coming off the Fruit Growers Express Company assembly line in Alexandria, Va. are diesel equipped.

Meanwhile other post war progress phases were underway. The food industry was working to solve problems of feeding the growing population of the United States with an equalized distribution of the nation's food supply. Competition from truck transportation helped spur the railroads to more elaborate service to their shippers.

Such factors, all ultimately on raising the standard of living for American families, made the mechanized refrigerator car a practical necessity. Whereas, the older types of mechanized cars were used only for transporting low temperature frozen commodities and maintained only zero temperatures within the cars, the "all purpose" car today provides any temperature from zero to 70° F. In each car a thermostat can be set to provide heat or refrigeration and to maintain the established degree no matter what the outside weather may be. Each car can carry either fresh or frozen foods, and operates by means of a self-contained refrigeration system.

The diesel engine in the new cars is a GM series 71, 2-cyl, 2-cycle, 34-hp, 1200-rpm engine, coupled to a 20-kw alternator, which in turn provides the 220-V, 3-phase, 60-cycle current needed for the system. The engine shuts down automatically for emergencies, but otherwise runs continuously. Equipment in each car in addition to the diesel-generator unit includes a twin condensing unit, twin compressors, blower meter and blower fan unit, an evaporator unit, and control panel. The engine when started operates for about 20 sec to attain running speed before the first compressor cuts in. In another 5 sec, the second is allowed to start. Average fuel consumption is approximately 1 gph.

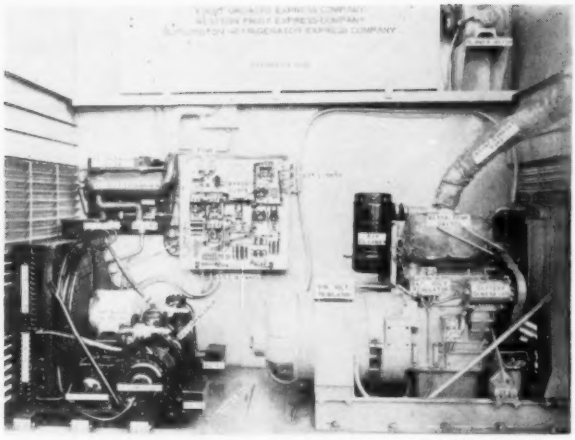
A modern 50-ft, 70-ton mechanical refrigerator car constructed by Fruit Growers Express Co., Alexandria, Virginia, in 1954.

Costs and Results

FGE and its associated companies, WFE and BRE, have an authorized investment in mechanical cars now in use and on order of around $13 million. As of June 15, 1954, the three companies had 330 mechanical cars in service. An additional 117 have since been run off the assembly line in the Alexandria shops on an average of 4 per day. During the first quarter of 1955 an additional 160 cars are to be built.

To June 1954, the fleet had handled successfully more than 10,460 shipments for a total of 18,130,000 mi, including many coast-to-coast trips under all weather conditions. FGE's mechanical cars are currently averaging about two loaded trips to one trip of the water-ice cars.

In addition to the mechanical refrigerator cars of the FGE, WFE and BRE as of June 18, 1954, it is reported that AT&SF has 30 mechanical cars in service; Pacific Fruit Express, 100 in service and 237 on order; and Northern Pacific Railroad, 50 on order for delivery in late 1954.



Dual refrigeration unit in all-purpose cars. Power unit with lagged exhaust is at right. Motor for blower is seen above. Compressors and condensers are at left. Heat exchanger is at left of control panel mounted on bulkhead.

The new "all purpose" cars are 50 ft in length and have 6-in insulation in the sides, ends, and floor, and 9-in in the roof. There is an all-welded metal sub-floor; and a heavy coating of "Insulmat" on the inside of the steel shell seals the exterior surfaces against moisture infiltration.

Economics of Mechanical Refrigeration

The 50-ft "all purpose" mechanical cars are priced at $21,500, as against $10,500 for the 40-ft standard cars, and the $12,500 cost of the 50-ft standard cars. To make up this difference in expense requires careful dovetailing of the different growing seasons across country and north and south. Cars must move all the time, and with full loads; and public response to the convenience and quality of frozen foods must continue to create demand.

An example of what is happening appears in the frozen citrus concentrates. The first load of these concentrates in a mechanical refrigerator car left Florida, February 25th, 1949. Rail movement of citrus concentrates in 1953, ran 2460 car loads. In 1954 to June 14th, refrigerator cars carried 3364 loads. This included (in 1953) 1120 loads carried in mechanical refrigerator cars, and to mid-June 1954. 1813 carloads.

Another factor in the shippers' satisfaction with mechanical refrigerator cars is the fact that by arrangement, servicing of cars enroute is rendered by whichever company's trained personnel is on duty on the area of need. Delays are kept to a minimum. The diesel-powered cars give reliable transportation.

The Diesel Engine Did It

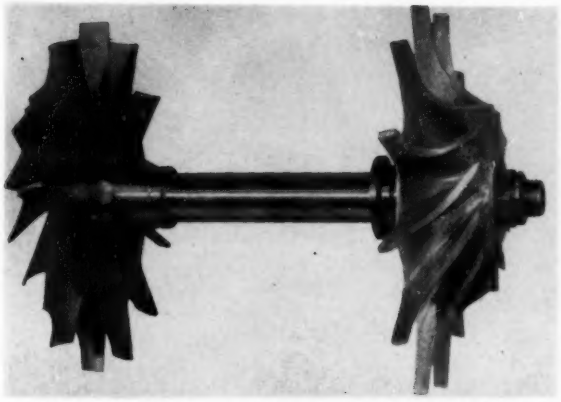
Historically, refrigeration of commodities in transport has had a long slow development. With the final adoption of the diesel engine as a key part of the modern mechanical car's equipment, the service has had a phenominal growth. Today's record shows some 20 items in addition to the citrus concentrates to have been successfully handled by the diesel-refrigerator cars. The promise for the future for the mechanical car and all its equipment in an expanding economy seems limitless.

The executives at FGE whose vision has helped pioneer the diesel-refrigerator car are John C. Hill, president; D. R. MacLeod, vice president; J. J. Quinn, general manager; C. E. Davis, comptroller; H. M. Nelson, general mechanical superintendent, Alexandria; B. E. Duff, superintendent, mechanical refrigeration; and D. N. Zirkle, general counsel and manager of public relations.

What Do You Know!

Here are some questions to test your general knowledge of the diesel field. Make your selections, then turn to Page 84 to check them.

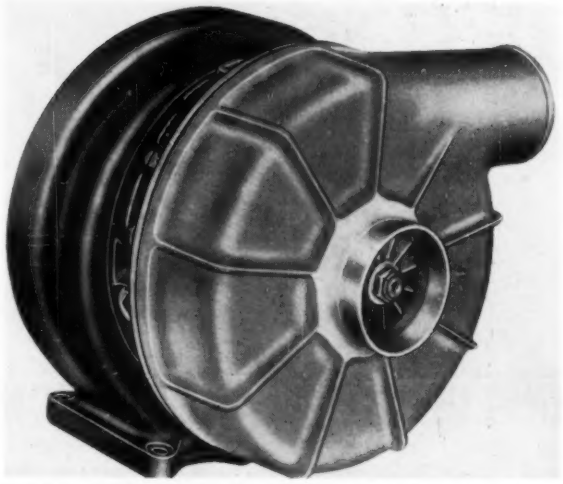
1. Current experimentation with gas turbines in buses would indicate that changes in bus design will be—
   a. drastic b. extensive c. relatively minor
2. Dimensions and weights of most large engine foundations are usually such that there is no need to worry about type or bearing capacity of subsoils.
   a. True b. False
3. Waste heat resulting from operation of engines with closed cooling systems is, in the final analysis, dissipated to which of the following?
   a. Cooling water c. The ground
   b. Atmosphere d. Cooling devices
4. Design of an adequate water and lube oil cooling system takes care of all heat problems in plant design.
   a. True b. False
5. In controlling gas-air mixtures in dual-fuel or gas engines, which of the following is the easiest to control as to pressure and temperature?
   a. The air b. The gas
6. Precooling ahead of a turbocharger is less practical than aftercooling of intake air because of the—
   a. greater amount of air to be cooled
   b. effect on the turbocharger
   c. small differential between ambient and wet-bulb temperature
7. By simply adding equipment for heating and cleaning, a conventional fuel system layout is perfectly satisfactory for burning heavy fuels.
   a. True b. False
8. A turbocharger must match the exhaust gas flow conditions of the engine. One design can be made to match a wide range of engines by—
   a. redesign of the turbine blading
   b. using interchangeable nozzle rings
   c. standardizing exhaust manifolds
9. Which railroad is considered to have the largest railroad shop building under one roof?
   a. Santa Fe c. Pennsylvania
   b. N. Y. Central d. Southern Pacific



Turbine wheel is at left and compressor wheel at right of shaft. Total weight of these rotating parts is 1 lb 13 oz.

Schwitzer-Cummins' Turbocharger

Design of the Schwitzer-Cummins' turbocharger calls for its application to small and medium size diesels in the 75- to 200-bhp range.



Complete assembly. Again, turbine is at left and compressor at right.

SCHWITZER-Cummins' new turbocharger has been designed as a further refinement in supercharging. It represents this company's answer to the effort to get more and more power into smaller packages. Primarily, the turbocharger is designed for use with diesels having a naturally aspirated output ranging from 75 to 200 hp.

Available in both air- or water-cooled executions, the unit weighs under 40 lb. The latter version has been designed with a water-cooled bearing housing for automotive application or a completely water-jacketed turbine for marine use. In the water-cooled automotive-type units, engine cooling water is circulated through the bearing housing providing a heat barrier between the turbine and compressor ends.

Ni-Resist and aluminum alloy castings are used for the turbine housings on the automotive and marine types respectively, with aluminum alloy castings being used also for compressor housings and covers. Bearing housings are of cast iron. For the turbine wheel which is of the radial-flow type, high-strength, cobalt alloy investment castings are employed. Compressor wheels are of aluminum alloy.

Currently, the turbocharger has a maximum inlet gas temperature of 1500°F and a top operating speed of 42,000 rpm, plus a large safety factor for overspeeding. Rotative parts are designed for minimum stresses at this speed. Lubrication of the sleeve-type bearings is provided normally by a line from the engine pressure system. To eliminate oil leakage, a piston ring-type seal is employed at each end of the shaft. Air under pressure from the compressor is directed behind each ring to aid in preventing oil leakage.

The turbochargers are reportedly adaptable to a wide range of engines with no change in the basic design necessary. A wide range of interchangeable turbine nozzle rings have been made available to facilitate matching the turbocharger to exhaust gas flow conditions of different engines.

Mounting the turbocharger to the engine is said to be relatively simple and inexpensive. In some instances, the turbocharger can be added to a naturally aspirated engine without requiring any additional under-hood space in the existing engine compartment.

From a performance standpoint, several advantages are claimed for the units, the principal one being that of lower engine fuel consumption per bhp at rated load, which improves still further at part-load according to the announcement.

Since immediate response of the turbocharger to sudden changes in engine load and speed is important to operators of variable-speed engines such as truck and bus applications, Schwitzer-Cummins has designed the units with rotating parts having low inertia. In addition, the turbochargers have been designed for long reliable service requiring only normal maintenance and care such as would be given any other part of the engine.

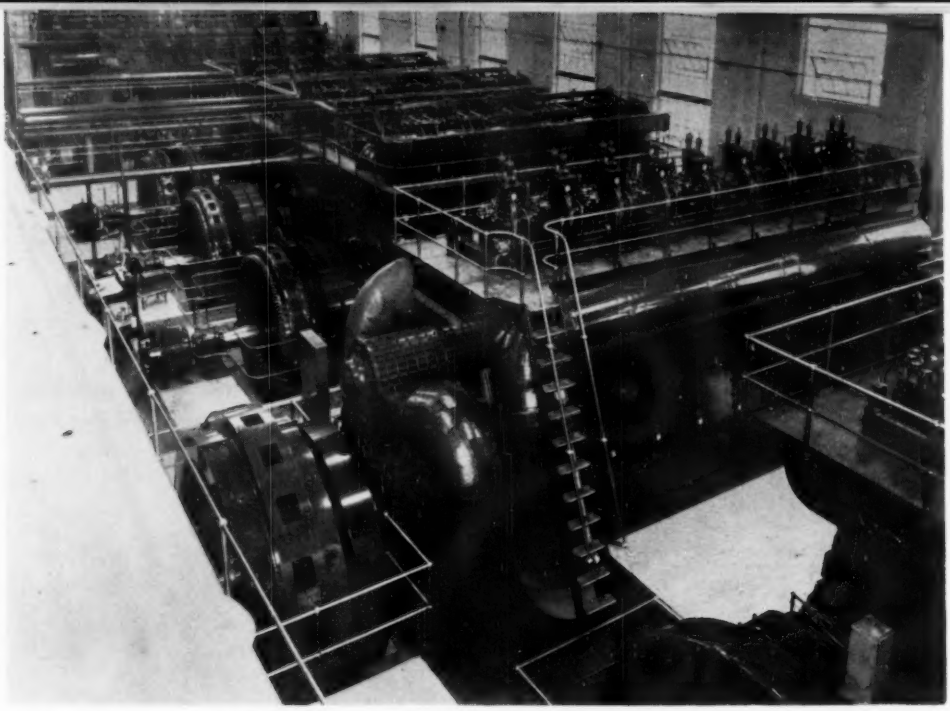


Fig. 1 View of the Grand Haven, Mich., power plant which indicates load growth. Engines and year installed are l to r: 5000-kw, 1952; 2715-kw, 1948; three 800-kw, 1930; 2715-kw, 1942; 1600-kw, 1937.

FUELS AND HIGHER ENGINE RATINGS INFLUENCE PLANT DESIGN*

By Robert Cramer, Jr.

Assistant Chief Engineer
Nordberg Manufacturing Company

DIESEL engine power plant design is an art as much as it is a science. Many of the principles are empirical and resulted from difficulties that have appeared in previous plants. These difficulties have been associated with gradual increases in engine ratings which reduced the physical size of the engine-generator unit and the building required to house it, but have not necessarily reduced the size of the auxiliaries. Air and fuel consumed are proportional to the engine's load regardless of its physical size. Cooling requirements are also proportional to load except for minor decreases due to increasing thermal efficiency of internal combustion engines.

These factors are changing the size relationship of auxiliary equipment and engine. They also accentuate ventilation problems, which in many cases were previously unimportant only because buildings were large in relation to the engine horsepower. Increasing use of heavy fuel and of natural gas also has brought new problems in the handling and preparation of engine fuel, particularly as to safety, fire hazards, and operating personnel convenience.

Engine Ratings Are Up

Increases in ratings of power plant engines manufactured by Nordberg since 1946 are depicted in chart form. These typify an industry-wide trend. There are competitive engines of comparable bore and stroke for each size. Ratings have been raised by increases in rpm and in bmep's for some engines and by new supercharged engine designs in the case of some 4-cycle engines.

Speed increases for the larger 2-cycle engines have been accomplished by structural improvements to increase substantially their rigidity, particularly against natural modes of vibration. Bearing pressures, both peak and integrated values, have been reduced by the higher speed. In some cylinder combinations firing orders have been changed to obtain smoother running engines. Increases in bmep have been made possible by improvements in the injection system and by streamlining and enlarging the air flow passage so that air flow per horsepower remains the same. Thus, mean cycle temperatures have not been increased by the increased ratings.

The municipal power plant at Grand Haven, Michigan presents an interesting case history of the growth of engine rating in relation to building size. The original building cross-section occupied in 1930 by 800-kw units has proven adequate for generating units of progressively increasing rating. The most recent unit, installed in 1952, is rated at 5000 kw, more than six times that of the original units.

**Abstract of a paper presented by the author at the International Meeting, Mexico City, D.F., Mexico—March 10-12, 1954—of the American Society of Mechanical Engineers.*

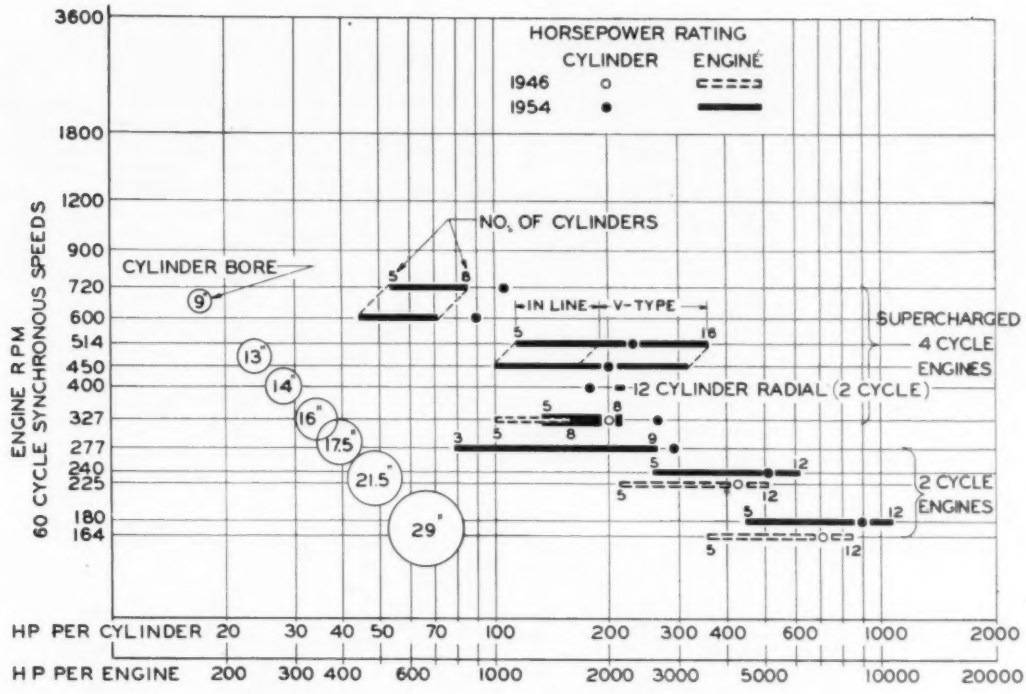


Fig. 2 Ratings of power plant engines produced by Nordberg since 1946.

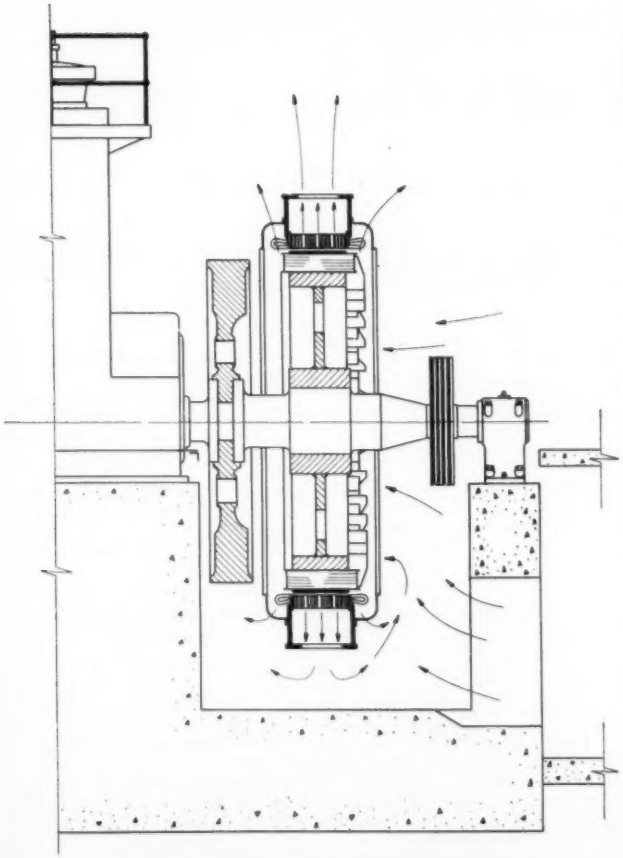


Fig. 3 Diesel engine generator ventilation.

Ventilation Problems

Power plant buildings must be ventilated for operator comfort and to cool the machinery, particularly generators and auxiliary motors. Both requirements demand attention be given to adequate air flow through the building and to adequate distribution of cool air to where it is needed. In addition, many plants are in dusty locations where cleaning of ventilation air as well as engine intake air is important.

A simplified cross-section of an engine-driven generator and its generator pit with the normal cooling air circulation is shown. Fan blades attached to the rotors induce the indicated circulation without requiring outside fans or blowers. However, circulation is only through the generator and not through the building. Un-

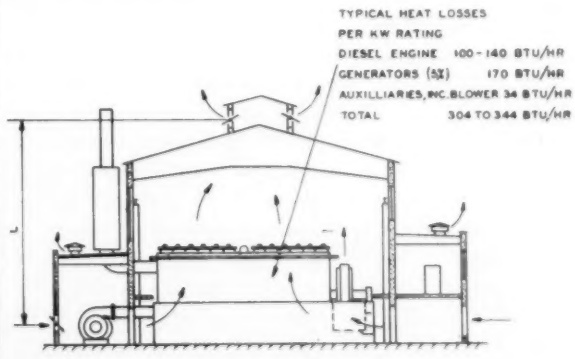

TYPICAL HEAT LOSSES
PER KW RATING
DIESEL ENGINE 100 - 140 BTU/HR
GENERATORS (5%) 170 BTU/HR
AUXILLIARIES, INC. BLOWER 34 BTU/HR
TOTAL 304 TO 344 BTU/HR

Fig. 4 Ventilation of diesel power plant.

less natural ventilation or mechanical ventilation provided in the building insures an adequate supply of cool air into this stream, and means of heated air disposal, the generator fans will only recirculate air which can become hotter and hotter.

Required areas for natural ventilation may be easily calculated. The first step is to establish heat losses from machinery. Electrical losses are obtained from the stated machine efficiency and are usually about 5 per cent of output at rated load for large generators and 8 to 10 per cent for smaller motors. Some auxiliaries such as motor-driven blowers have radiation losses in addition to motor losses. Radiation and convection losses from engines are a function of jacket and crankcase temperature, shape and area of the engine, and amount of exposed exhaust piping rather than of the engine rating. Hence these losses have decreased with rating increases.

A simplified diagram of a typical large diesel plant shows the flow of ventilating air and some of the typical heat loss values. Natural ventilation is by far the most commonly used. Forced ventilation by motor-driven fans is usually found when the surrounding conditions require filtration or washing of the building air.

The Tacubaya diesel plant of the Mexican Light and Power Company is an example where particular attention was paid to building ventilation at the design stage. The entire system was based on a calculated natural ventilation with adequate inlets properly distributed into the basement, gratings in the operating floor permitting this air to rise to the operating floor at points which achieve maximum comfort for the operators, and large louvered outlets at the peak of the roof to discharge the heated air.

During initial operation, a problem emphasized the need for study of air distribution as well as calculation of quantity. Generator rotors are constructed of circular steel plate reinforced by radial ribs. The ribs made a centrifugal fan of each generator. Being located half in the generator pit and half out, each generator discharged heated air toward the adjoining one. A progressive increase in temperature was observed, reaching a value of about 130°F at the sixth generator. This was intolerable both for men and for insulation. Covering the ribs with sheet metal plates to make them smooth discs, made the fan effect negligible.

A later development in natural ventilation of a power plant operating in a very hot climate occurred at New Broken Hill, Australia. Rating of the engines was based on an ambient 105°F temperature which sometimes lasted for months at a time. In this case, ventilating air enters the generators from the pit in the normal fashion, but the generator stator is so constructed that all heated air is discharged at the top. Rectangular openings were designed so that a funnel and a 10-ft chimney section could be added if required to make sure that heated air would be discharged toward the roof peak without recirculating. This was not found necessary.

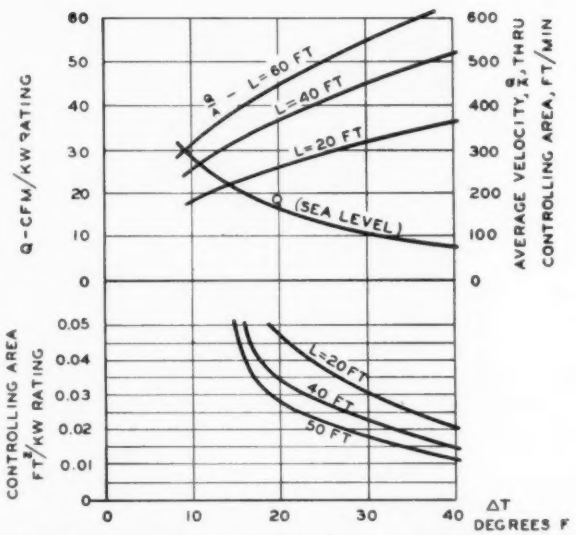


Fig. 5 Velocity, area, and flow for natural ventilation. Calculation below.

METHOD OF CALCULATING NATURAL VENTILATION. For forced ventilation, calculations follow normal ventilating practice for pressure loss but calculations for quantity parallel method given below.

For ΔT required air flow is

$$Q = \frac{H}{\Delta T \cdot c_p \cdot d_l \cdot 60} \quad \text{per kw rating (1)}$$

With air at ΔT, head causing flow is

$$h = \frac{L \cdot \Delta T}{T_2}$$

and induced velocity due to head

$$v = 60(2gh)^{\frac{1}{2}} \quad \text{ft per min (2)}$$

Flow through controlling area is

$$Q = A \cdot v \cdot c_d$$

When these equations are combined, and using a value of $T_2 = 580°R$ (120°F) and $c_d = 0.65$, flow in cfm per kw rating reduces to

$$Q = 13.0 \cdot A \cdot (L\,\Delta T)^{\frac{1}{2}} \quad (3)$$

If inlet and outlet are substantially equal (both controlling areas) Q must be reduced to about 0.7 of above value. Equating the two expressions for Q and solving for A

$$A = \frac{H}{13.0 : L^{\frac{1}{2}} \cdot \Delta T^{3/2} \cdot c_p \cdot d_l \cdot 60}$$

or, when $c_p = 0.24$ and $d_l = 0.072$ at 90°F and sea level, and for an average value of $H = 325$ Btu/hr per kw rating

$$A = 24 \cdot h^{-\frac{1}{2}} \cdot T^{-3/2} \quad \text{ft}^2\text{/kw rating}$$

Plots for values of ΔT from 10°F to 40°F; values of L from 20 to 60 ft; also values of Q from (1); and average velocity $\left(\frac{Q}{A}\right)$ rfom (3) are shown. Since most heating occurs above operating floor level, values of 30°F to 40°F are permissible even where outdoor temperatures occasionally exceed 90°F.

NOMENCLATURE

- A = Controlling (smallest) opening for ventilating air, inlet or outlet, ft²
- d_l = Outdoor air density, lb/ft³
- c_p = Outdoor air specific heat, Btu/lb-°F
- ΔT = Permissible temperature rise, °F
- T_1 = Temperature of outdoor air, °R
- T_2 = Temperature of heated air, °R (T_1 plus ΔT)
- Q = Quantity of air flowing thru building, measured at outdoor conditions, ft³/min per kw rating
- H = Heat losses for dissipation, Btu/hr per kw rating
- L = Average height from air inlets to outlets, ft
- h = Head, ft
- v = Velocity, ft/min
- c_d = Coefficient of discharge

Probably the most extreme ventilation problem is that encountered at the enormous DC generating plants for aluminum reduction located in Texas and Louisiana. The nature of the operation makes it necessary to wash and filter all ventilating air entering the buildings and to arrange ventilation of the entire plant site so that heated air discharged at one point will not recirculate to other parts of the plant. The elaborate system originally developed by the Aluminum Company of America for heat disposal is shown.

All heated air from each unit, including exhaust gas, is discharged through one stack. Combined effect of the generator ventilating fan, radiator fan, and of the engine exhaust that is arranged to act as an ejector, is to cause an upward discharge velocity of the order of 2000 fpm. This effectively directs the heated air beyond the limits of the plant site. Projected performance of the ventilating system has been completely borne out in operation.

Fuels Affect Plant Design

The sudden cost rise of refined diesel fuel during and shortly after the war made it economically imperative for many plant managers to find fuels to produce power at the lowest overall cost. For those plants within reach of gas pipeline, natural gas has been by far the lowest cost fuel. It also insures the lowest maintenance costs of any fuel now available.

Heavy fuels, both residual and blended, are intermediate in cost between natural gas and distillate fuels. However, heavy fuels in general bring with them increased

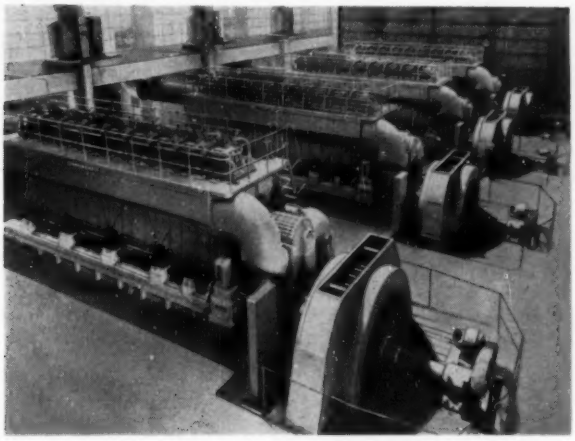


Fig. 6 Typical arrangement for top air discharge from generators.

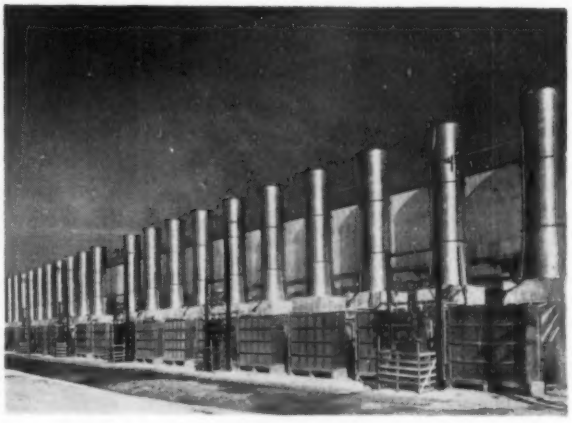


Fig. 8 Engine ventilating stacks at aluminum ore reduction plant.

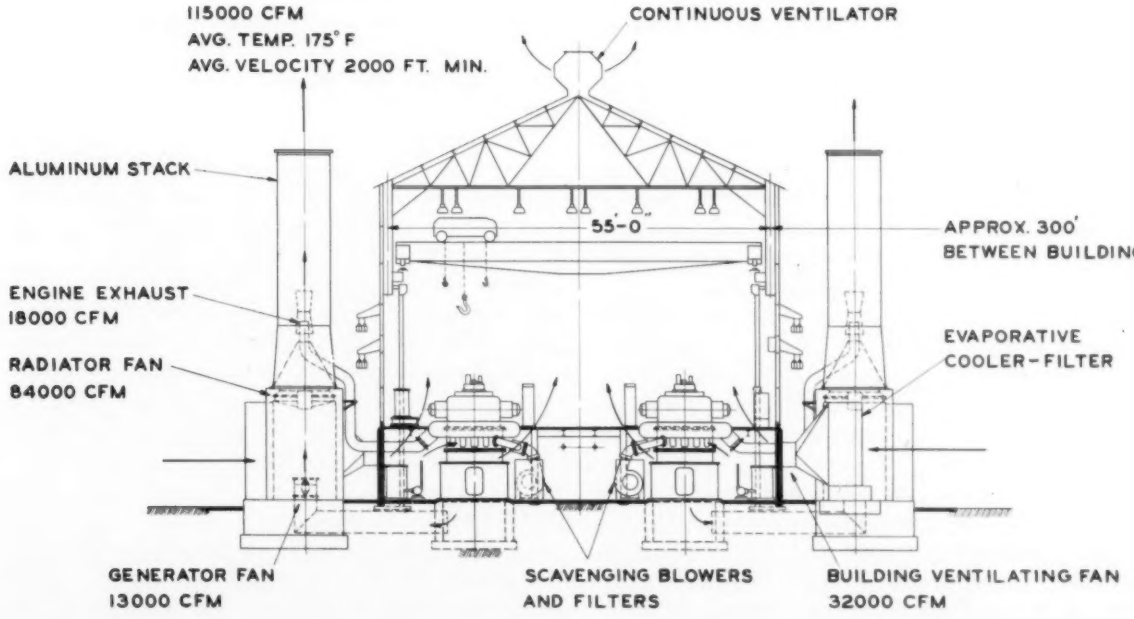


Fig. 7 Ventilation of Alcoa power plant.

maintenance costs and operating difficulties which are disliked by the operators. Nevertheless, savings in fuel cost may be 20 to 50 per cent of the total, and even after deducting increased maintenance costs will be enough to enable a plant to compete with its utility neighbors.

However, the purpose of this article is not to make a case for different fuels, but to show that in the original design of a power plant or in its modification, the fuels to be used are an important influence.

Gas-Burning Engines

The modern dual-fuel engine is designed to operate at maximum efficiency on natural gas or oil fuel and to be instantly convertible from one to the other fuel. This type of engine depends on very accurate gas-air mixture control for its load-carrying ability and its fuel economy. Its load-carrying ability also depends on a controlled inlet air temperature.

Gas-air mixture control is very important. Through this control, the fuel consumption of dual-fuel engines on a basis of Btu per hp hr is less than the best oil- burning engines, and at less than three-quarters of rated load, mixture control directly controls the fuel consumption.

Two-cycle engines and 4-cycle supercharged engines admit air and gas separately to the cylinder so as to avoid loss of gas in the scavenging process. Thus, regulation of air and gas flow is separately done and both depend on a steady, controlled pressure and temperature at the control point. This is not usually difficult for the gas supply when available at a pressure sufficiently above that required by the engine, because modern gas regulators have a flat characteristic from about 10 per cent to over 100 per cent of rated flow.

Air supply presents more difficulties. Combined temperature and pressure effects in most areas may produce as much as 30 per cent density variation. Temperature is the major factor and therefore means must be provided to maintain a closely regulated temperature in the engine air box. Currently, the only practical medium for maintaining a uniform air temperature is water in an intercooler, usually of the finned-tube type. The lowest temperature that can be maintained through the hot season is desirable and is usually set at 90°F to 100°F, depending upon the availability of intercooler water having a suitable temperature. For high-pressure supercharged engines, temperature can be somewhat higher.

Air pressure rise in the blower causes an adiabatic temperature rise upwards of 30°F. Hence, when outdoor ambient temperature is in excess of 60°F to 70°F, cooling is required. When it is below 60°F, heating may be desirable. This is especially true when temperatures drop near freezing and below.

Source of water for intercooling depends entirely on local conditions. Some installations use well water and waste it. Others use well water and then re-use it as makeup for the cooling tower, add it to the public water supply, or re-use it for industrial purposes. In some installations, water is withdrawn from a copious municipal or industrial supply by a circulating pump and returned to the same supply without loss of pressure. In many cases it becomes necessary to use evaporative cooling to supply suitable intercooler water. In this case it is always desirable to reach the lowest possible temperature, *i.e.*, the local wet-bulb temperature.

Since cooling towers normally employed for jacket water and lube oil cooling for economic reasons operate with the sump water at 10°F to 15°F higher than wet-bulb, this water is not suitable. The solution has been to employ a separate small cooling tower for this purpose and to operate it within 1°F of the wet-bulb temperature, usually under 80°F even in extremely hot weather.

The maximum intercooling requirement at 100°F outdoor temperature is approximately 200 Btu per hp hr, which requires approximately 0.04-gpm circulating rate for a 10°F rise, and proportionately less for a higher temperature rise. By appropriate interconnection with the jacket water system, the intercooler and its circulating pump can also be used for heating the blower discharge air in extremely cold weather.

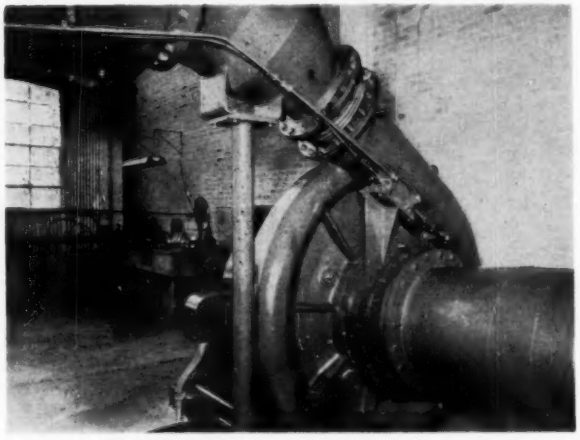


Fig. 9 Inlet guide vane control on blower.

Pre-cooling of intake air by means of small evaporative coolers of the same type and size as described has also been used. Due to the extremely small differential between the outdoor air and wet-bulb temperature, they are not very effective except in very dry climates.

Mixture control is generally accomplished by instruments that sense the exhaust temperature of the engine. They regulate the inlet air quantity to maintain either a fixed exhaust temperature or an exhaust temperature that is related to the load. The latter is done through a mechanism which controls air quantity at a predetermined relation to governor position.

Heavy Fuel

Heavy fuels are handled much the same as the more common distillate fuel except that they require heating and cleaning. Many psychological factors are involved in burning heavy fuel in diesel plants. Heavy fuel is messy.

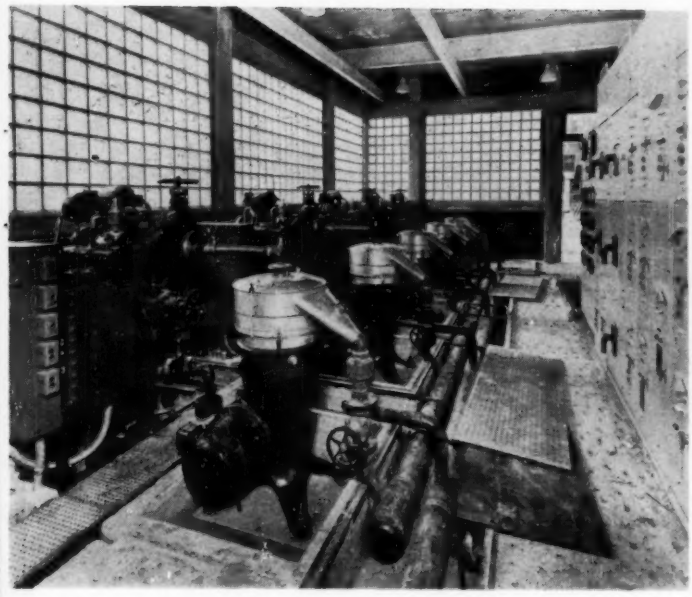


Fig. 10 Centrifuge building at Tacubaya Plant.

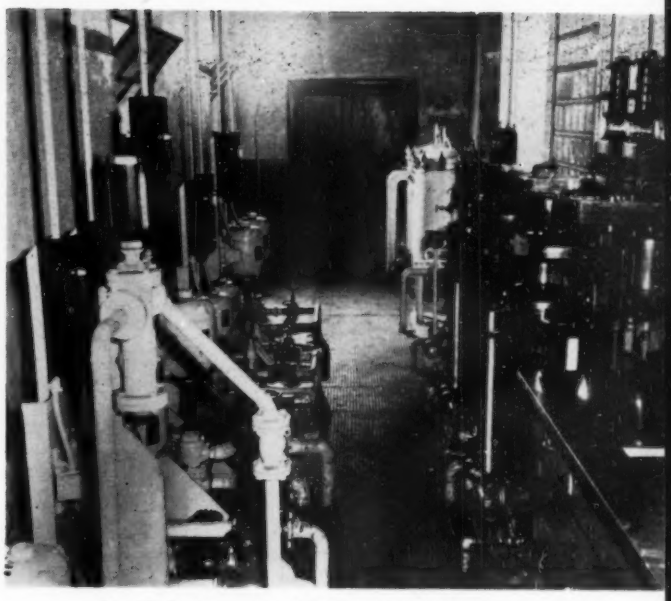


Fig. 11 Fuel room at Lake Worth, Florida Plant.

It is extremely penetrating when hot and becomes very difficult to clean when cold and congealed. Cleaning centrifuges is a dirty job and the disposal of the solid refuse is a problem. Operators soon learn that the greater the flow through a centrifuge, the less the cleaning operation that must be done even though this defeats the purpose of centrifuging.

For such reasons, it is extremely important when designing a plant for heavy fuel operation to consider all these factors and afford maximum facilities for the operators. At the Tacubaya plant, centrifuges and primary heaters are located in a separate building. Operators in this building are responsible for the conditioning of the fuel.

The original design provided a stainless-steel cleaning bench with a vise for disassembly of centrifuge bowls. A stainless-steel sink with running hot and cold water was provided for convenience in cleaning the machines and for operators to wash themselves. Because original estimates of available fuels indicated that some might have solids of 1 per cent or more, the design also provided a trench in the floor for a conveyor to remove the centrifuged solids if this became necessary (The heavy fuel used so far has been of sufficiently low solid content so that the conveyor has not been installed).

The Lake Worth, Florida plant is a smaller diesel plant, about 14000 hp, which also burns Bunker C fuel. While this plant is not large enough to justify a separate crew for fuel cleaning, the same facilities for cleaning centrifuges and washing up have been provided.

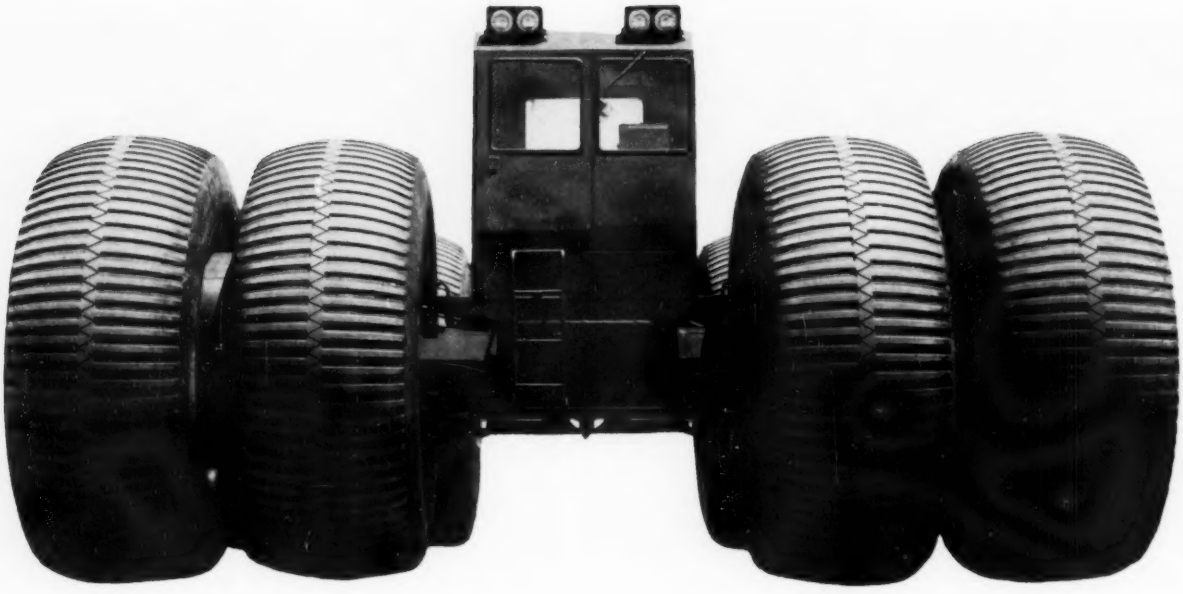
In a heavy fuel plant, it is also important to pay attention to all details which involve fuel leakage. This includes pipe joints which must be welded or sweated to be tight against this penetrating liquid, transfer pump packings, fuel pump packings and gaskets, valve packings, filter and centrifuge joints, and the like. Mechanical shaft seals have proven far superior to stuffing box packings. In addition, size of all drains for heavy fuel must be substantially increased, perhaps two or three times those provided for light fuel, and they should preferably run in close proximity to hot water or hot fuel lines.

The Tacubaya plant was probably the first large plant in which fuel day tanks were eliminated. In their place a circulating system was provided in which there are no dead ends anywhere and in which the heated heavy fuel is always kept moving except on shutdown. Facilities are provided for filling and operating the system with light fuel.

Conclusion

As stated in the beginning, the design of diesel engine power plants is an art as much as it is a science. The art consists of a full knowledge and appreciation of all factors involved, including the economic and psychological as well as purely mechanical, electrical, and physical factors involved. Each power plant presents its own problems. These must be thoroughly studied and understood before the basic concept of the plant is evolved.

After the plant is built, the soundness of the planning will become evident. Operational refinements and conveniences will be appreciated. Study should continue, however, so that maximum operating efficiency can be achieved. This is particularly important as a basis for later expansion of generating capacity.



Texas-Size "Jeep"

TO the folks at R. G. LeTourneau, Inc. of Longview, Texas, this Sno-Buggy is a Texas-size "jeep". Rolling on the world's largest tires, the Sno-Buggy operates in a similar manner to a diesel-electric locomotive where a diesel-electric generating set powers traction motors in the trucks. The traction motors in this case are LeTourneau electric wheels, introduced by this manufacturer in 1953.

The first model of the gigantic exploratory vehicle and prime mover is on its way to the North Country for test as a trail blazer through deep, soft, powdery snow.

Eight tires, each one 10-ft high and 4-ft wide, are mounted dual-fashion on the four LeTourneau electric wheels of the Sno-Buggy. This number of tires reportedly provides such a high degree of flotation for the 23-ton vehicle that they have been tested with only 5 lb of air pressure during preliminary runs of the machine at Longview.

Possibilities for the Sno-Buggy's use over unstable terrain are believed to be almost limitless. The machine can be the transportation answer wherever you can't drive an ordinary land vehicle, propel a boat, or land an aircraft. Besides exploration and trail blazing, its work may be transportation of personnel or supplies and perhaps rescue missions.

Each wheel has its own built-in electric drive motor and gearing system, simplifying the design of equipment with all-wheel drive and all-wheel steer.

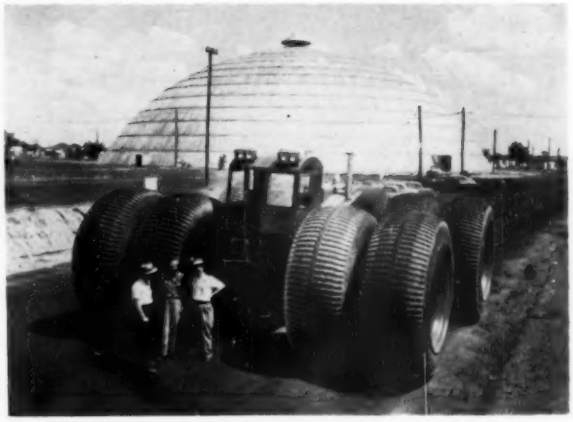
LeTourneau engineers made the flotation and traction efficiency of their Sno-Buggy match the drive and maneuverability of the electric wheel by developing the tires in cooperation with Firestone Tire and Rubber Company. Air pressure varies according to the number of tires supporting a vehicle and the weight of the vehicle could range from 4 to 25 lb. Their outside diameter is 10 ft and the rim diameter is 5 ft, 8 in.

With the eight largest tires, the Sno-Buggy has a 16-ft width of rubber in contact with the ground at the front and rear of the machine. To cut down weight and increase buoyancy, aluminum has been used in tire rims and several other places on the chassis.

Just a quick glance at the Sno-Buggy seems to give a picture of nothing but tires. But to make them roll, there's a 400-hp engine and generator nestled among them to provide power.

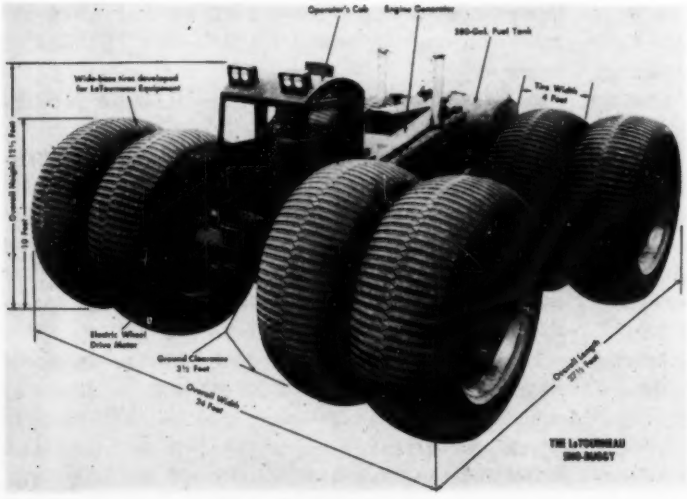
The Sno-Buggy operator, in a cab at the front of the machine, easily controls the vehicle's travel, including steering, by small electric switches. The braking method is a regenerative electric system. For emergency stops and parking there are spring-loaded, bimetallic friction brakes integral with the wheel motors. The latter set automatically when the electric power to the motors is turned off.

The speed of the Sno-Buggy on the rough going of deep snow, boggy swampland, or loose sand, is 8 mph—forward or back.



Obviously proud of the huge vehicle are two LeTourneau vice-presidents flanking the company's electrical research head. In background is the unusual LeTourneau Semisphere Building.

Next to the standard jeep, the gigantic machine looks like one Texas brag that is well substantiated.



The size and features of this exploratory vehicle are what it needs to go where ordinary land equipment cannot. If it were equipped with single tires instead of duals, overall width would be only 15 ft instead of the 24 ft shown.

Beating a Heating Problem

by Hugh G. Jarman

DIESELIZATION on the Canadian National was begun by replacing steam locomotives in road freight service. Following this, the company wanted to dieselize the passenger service on the same runs. Business however did not warrant the purchase of diesel-electric passenger locomotives; and in order to use the freight units in passenger service, it would be necessary to have passenger car heating systems.

Passenger car heating has posed a problem to Canadian railroads since the days of the steam locomotive. During the winter months when boilers were operating at their lowest efficiency there was the added drain of steam for passenger car heating.

Since it was not economically feasible to make a capital investment in passenger locomotives due to the amount of traffic, CNR engineers set about the task of developing a system by which the new diesel-electric road freight units could be used in passenger service.

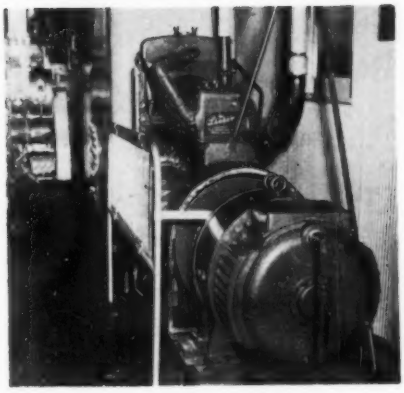
To accomplish this purpose CNR redesigned one of their latest type of all steel boxcars. Originally these cars were designed for insured valuable freight shipments and were attached to the regular express trains. The car was modified eliminating the usual side doors which were replaced by passenger-type doors at each end of the car. This permitted access to the car and its equipment while the train was in motion. Trucks were replaced by modern passenger car trucks equipped with anti-friction bearings. The cars are also entirely insulated against cold.

A regulation-type passenger car door was also built into each side of the car and the car partitioned into two halves. The front half houses the two 1100-gal water tanks for the boiler and also a 325-gal fuel oil storage tank with space provided for a second fuel tank if necessary.

A 3000-lb Vapor Clarkson steam generator provides passenger car heat. Power to operate this generator is obtained from a 2-cyl 22-hp Lister diesel engine. The direct-connected generator provides power for the steam generator set as well as for the 16-cfm air compressor which power air-actuated automatic controls. Car lighting is also taken from this generator. A 24-v battery serves as both a starting battery for the diesel engine and for emergency lighting.

Equipment is arranged on both sides to provide a clear isle down the center of the car, with each piece of equipment installed far enough from the wall so as to permit easy servicing from all sides. On the aisle side a stainless steel railing and safety guard has been built.

Canadian National Railways increased the utility of its diesel-electric road freight locomotives by constructing a special unit to provide passenger car heating.



Power for the operation of the steam generator car is supplied by the engine generator set shown above.

At far left is the air compressor for the car which powers air actuated controls for the steam generator and car heating system before locomotive is connected to the train.

Here, maintenance man makes adjustments on the controls of the steam generator unit. This unit is similar to many others used for passenger car heating.

For easy removal of any unit for replacement or major servicing, a large removable hatch has been built in the car roof. This allows major components to be replaced as a package thus enabling the car to be released for duty without any long periods of downtime.

Steam generating equipment operates under automatic control. The only manual attention necessary is that of the separator blowdown which is accomplished by remote control from the locomotive.

Operation

The steam generator car is put into service when a train is made up at the marshalling yards. Between the time the train is made up and its departure, the generator heats the train and has eliminated the necessity of temporarily hooking the train up to the central heating system, which is the normal practice.

The unit does not require any further attention until the train returns to the yard after its round trip unless there is an overnight stop over at the other end of the line, in which case the unit is shut down until the following day and started up before the train makeup on the return trip.

It should be mentioned here that the heat supply is governed entirely by thermostats in each car, the heat bypassing all cars in which the controls have been automatically closed.

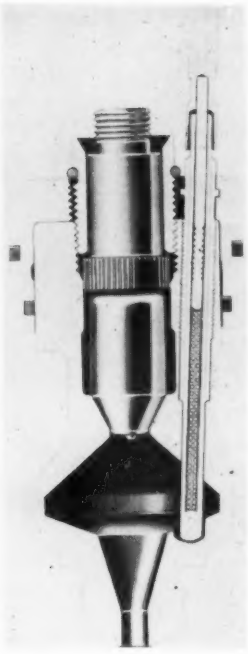
After extensively testing these steam generator cars, the CNR believes they have succeeded in solving the train heating problem and in so doing have also saved themselves a sizable investment.

In addition, any available diesel locomotive of sufficient size can be utilized for passenger service. Reportedly, more of the road's locomotives are equipped with steam generating equipment thus eliminating the need for holding a unit specially for passenger train service.

Summing Up

At present, it is not the CNR's intention to use these steam generator cars on their crack transcontinental trains for when these are dieselized, special passenger locomotives will be purchased for this specific job which will of necessity be equipped with steam generating equipment.

Steam generator car units will be used only on runs up to 500 miles and where diesel freight locomotives capable of speeds up to 65 mph will be sufficient to operate the train on schedule.



Shown in relationship to the injector and precombustion chamber, the glow plug is an important part of the direct electric starting system.

Each morning during the cold weather starting tests, an office girl with no previous tractor experience started the test unit.

Pushbutton Starting for D4's

Direct electric Starting equipment is now available for Caterpillar D4 tractors.

CAT recently announced the availability of direct electric starting for D4 tractors. The all-weather completely automatic pushbutton starting unit with newly developed glow plugs is designed to provide positive starting with fingertip control from the D4 tractor seat.

The tractor's 24-v electric starting system, using heavy-duty components coupled with long-life inexpensive batteries, is designed for simplicity and dependability under the most rigorous working conditions. The batteries are protected from possible damage by being neatly installed under the hood in the space formerly used to house the gasoline starting engine.

Incorporated into the system are glow plug attachments that provide positive starting in below freezing weather. They prevent battery life from being drained away through prolonged cranking of the diesel engine during cold winter months. These glow plugs are the same effective cold weather starting aids offered as attachments for several models of Cat industrial, marine engines and diesel electric sets for the past two years.

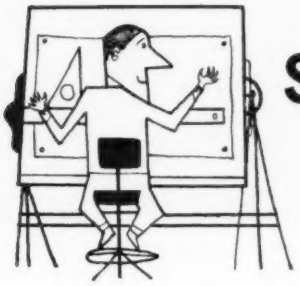
The glow plug has been developed through years of research in cooperation with GE. About the size of an ordinary pencil, the glow plug is actually a heating element, part of which extends into the precombustion chamber of the diesel engine. However, its construction must be such that it will be of sufficient strength to withstand the terrific combustion shocks encountered.

There is a marked similarity between the construction of a glow plug and the heating element of the domestic electric range. A fine resistance wire fits inside a tube or sheath and the entire cavity is filled with magnesium oxide. The magnesium oxide acts as a support and as an electrical insulator between the wire and the sheath.

However, when electric current is applied to the wire, the heat is transferred to the sheath through the magnesium oxide. The process is very rapid with the sheath attaining a temperature of 1800°F within 30 sec. This heats the air in the precombustion chamber and aids considerably in igniting the fuel injected onto the chamber when the engine is cranked.

In one test, a D4 tractor was left to stand outdoors all winter with no protective housing. An office girl (with no previous tractor experience) started the tractor early each morning except for weekends to demonstrate the ease and simplicity of the starting unit. After a weekend "soaking" of cold weather, Monday morning starting proved a real test of the system.

Records were kept of temperature and cranking time. A preheat time (time glow plug is energized before cranking) was established and varied from 0 to 4 min., depending on how cold it was. Results show an average cranking time of 1.15 sec for the days the temperature recorded below freezing. Not once did the engine fail to start after being preheated with the glow plugs. Batteries maintained a full charge regardless of length of heating time or weather temperature.



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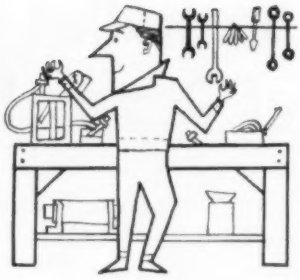


Recent engine and equipment modifications, procedures and recommendations straight from the different manufacturers to you

GM—Injector Installation Service Hint —Series "51", "71", and "110" engines . . . .

As a precautionary measure against any possibility of scoring injector parts upon initial installation due to lack of lubrication, GM recommends that trapped air be bled from the injector before making up fuel outlet pipe connections. This will allow the entrapped air to be forced out the "loose" connections by pressurized fuel entering the injector from the pump. This may be accomplished by briefly cranking the engine with the injector racks set at no load.

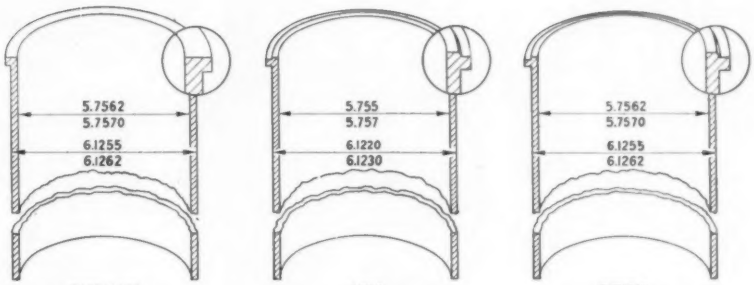
In addition to bleeding, lubricate the upper end of the injector by filling the follower spring cavity with clean engine-weight lube oil through the vent hole on the side of the injector body opposite the control arm.

This additional lubrication is desirable for the Series "51" injector due to the enclosed injector spring which does not permit external lubrication as readily as Series "71" and "110" injector designs.

★ ★ ★

CATERPILLAR—New Piston and Liner Groups—D4, D6, D7, and D8 Tractors; D315, D318, D8800 and D13000 Engines; No. 112 Motor Graders; and No. 6 Shovels.

Provided in the parts groups now offered by "Cat's" parts department is a piston assembly, cylinder liner, liner seals, and a liner gasket. By purchasing the complete groups instead of the individual parts, owners will save money and in one purchase, obtain all the parts necessary to recondition one cylinder.



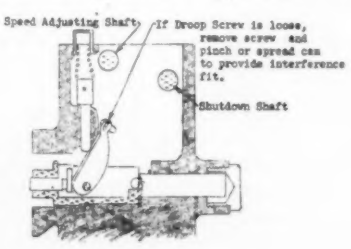
INTERNATIONAL-HARVESTER—Loose-Fitting Cylinder Sleeve—TD-24 Crawler Tractor and UD-24 and U-1091 Power Units.

A new loose-fitting cylinder liner, 270 602 R1, has been released for use on the 1091 Series diesel and natural gas engines, replacing the tight cylinder sleeve 250 859 R3. Along with this change a new cylinder head gasket, 269 676 R1, is released for use with the new sleeve as it overlaps the flange at the top of the sleeve preventing the sleeve from moving vertically in the cylinder bore. The tight service cylinder sleeve 250 859 R3 has been revised at the upper end so as to be the same as the loose-fitting sleeve (250 602 R1) to facilitate manufacturing and will only be furnished with one ID and OD size.

Service Section take a bow; this is your coming-out party. The planning is done, flow of material started, and here you are. Our letters show that you have been wanted. Now we hope that you'll be around a long time getting bigger and better. Here's luck for a useful and productive future.

MACK — Droop Screw Looseness — All engines using Woodward Hydraulic Governors . . . .

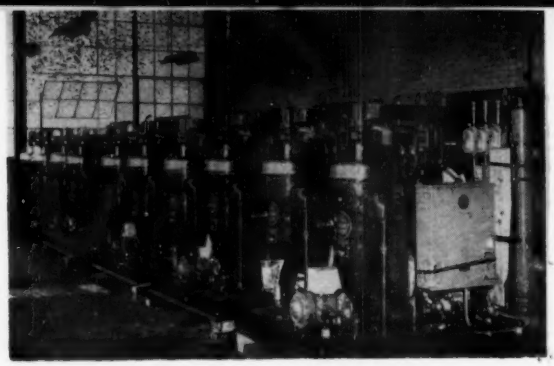
"Droop Screw" fit in the torque-control cam should be checked at time of governor adjustment. It should be a snug fit since the servo-piston will be held open if the screw falls out. Mack has reported some such occurrences.


Speed Adjusting Shaft
If Droop Screw is loose, remove screw and pinch or spread can to provide interference fit.
Shutdown Shaft

Use wrench 17-T-1781 (apparently Mack tool number) to check fit. There should be a definite bind or resistance to turning. A loose screw may be tightened by tipping the cam up so the slot can be spread or pinched (see illustration). This can be done without dismantling the unit. Also make check when installing new or reconditioned governors.

Controlled Preparation of Residual Fuels

Diesel Economy Devices, Inc., recently shipped ten residual fuel oil conditioning units to the Brazilian Government to complete the conversion of their diesel tanker fleet for burning Bunker C fuels. Here are some details of their units.



Five of the order for ten residual fuel oil conditioning units ready for shipment to the Brazilian Government.

ECONOMIC necessity is causing many a diesel plant operator to cast a speculative eye over the possibilities of burning the lower-priced residual fuels. Experience with heavy oils has shown them to be suitable fuels for diesels—with many "and's", "if's" and "but's". DIESEL POWER, through its editorial columns has long advocated the use of residual fuels *where practical* and has kept its readers informed of the economic aspects as well as the problems that go along with its use.

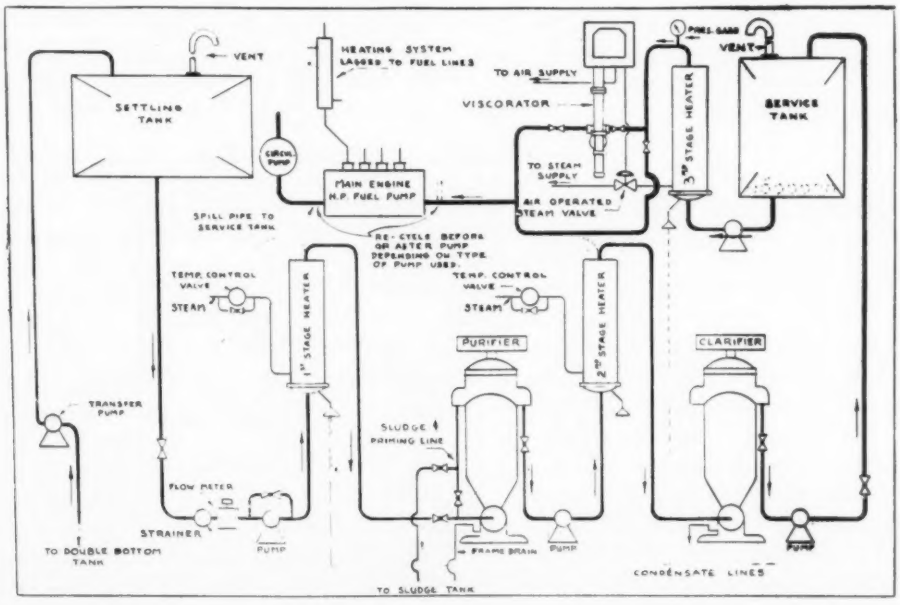
One major problem is the method of fuel preparation and an American firm, Diesel Economy Devices, Inc., has their solution in the form of a conditioning unit. The principles applied are based on a great deal of work done in Great Britain by the Shell Development Company and the Anglo-Saxon Petroleum Company, probably best known by the works and writings of John Lamb. The firm operates under patent immunity granted from the Shell Development Company.

Basic elements of this new unit are the same as have been used in the preparation of heavy fuels for several years, except something new has been added—a Viscorator—about which more later. The unit itself consists of three stages of heating and two of centrifuging.

In operation the residual oil is first metered and passed directly to the initial heating stage. From this heater the oil goes to a centrifuge which removes about 70% of the water and solids. The oil leaving this centrifuge is then heated again and passed through the clarifying centrifuge which removes nearly all of the remaining solids making it ready for the day tank. Only two steps remain before fuel reaches the injectors. First, the fuel passes through a final heating stage and then through the continuous sampling element of the Viscorator. The latter, sensitive to viscosity, controls the degree of final heating.

At this point let's take a look at the Viscorator. Its function is to maintain automatically and continuously a predetermined fuel viscosity for fuels having characteristics within the range for which the system was designed. The device continually samples the fuel leaving the heaters, determines the actual viscosity, and regulates a control valve supplying steam to the final heater. Heat input to the final heater is regulated so as

(*Concluded on Page* 87)



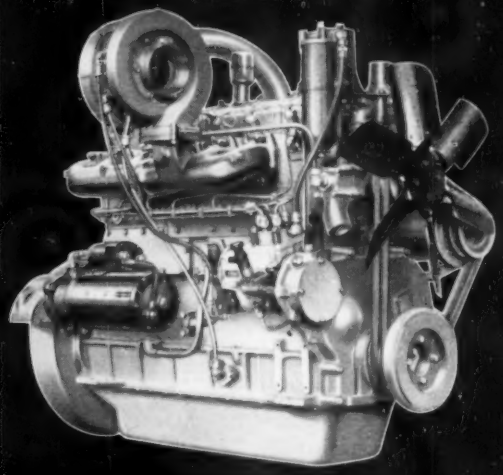
Flow diagram showing the components of the unit integrated into the complete fuel supply system.

EVERYWHERE— THEY GO!

turbocharged WAUKESHA Diesels

with the

PAYLOAD POWER PLANT



135-DKBS TURBOCHARGED DIESEL—six cylinder, 4¼-in. x 5-in., 426 cu. in. displacement, maximum hp. 185 at 2800 rpm. Get Bulletin 1617.

For greater power at lowest fuel cost—the Waukesha Turbo-supercharged 135-DKBS! It is a compact, powerful, heavy-duty, six-cylinder, four-cycle, full Diesel. The patented combustion chambers burn all standard "high-speed Diesel fuels" having cetane values of 45 or above. This powerful supercharged Diesel offers lively acceleration, clean burning, prompt starting, a tremendous reserve of power, and great overall economy.

The exhaust turbocharger system of supercharging affords a great increase in horsepower with a minimum of parasite load. Even without an intercooler the maximum power available from the Model 135-DKB Diesel Engine is increased from 147 hp. to 185 hp. at 2800 rpm. Without positive drive from the engine, the parasitic load decreases at part engine load, which improves overall fuel economy throughout the speed range.

Other advantages of the exhaust turbocharger are a relatively light and compact installation, flexibility in mounting, and the smoothing out of the exhaust impulses by the turbocharger turbine. Contributing to the Waukesha turbocharged Diesel's complete reliability and long-lived, trouble-free operation are time-tested and war-proved features developed in over 45 years of study and experience in building heavy-duty industrial-type internal combustion engines.

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.

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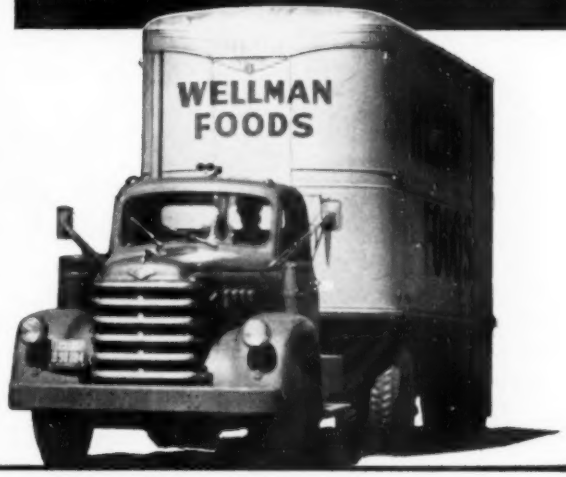
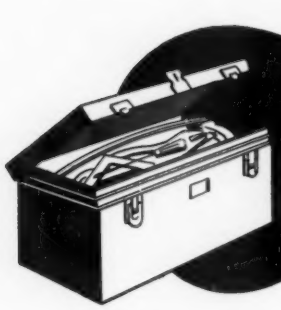


THIS WAUKESHA 135-DKBS powered high-speed over-the-highway rig operates in the Northern California-Oregon region.



Straight from the Tool Box

This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.

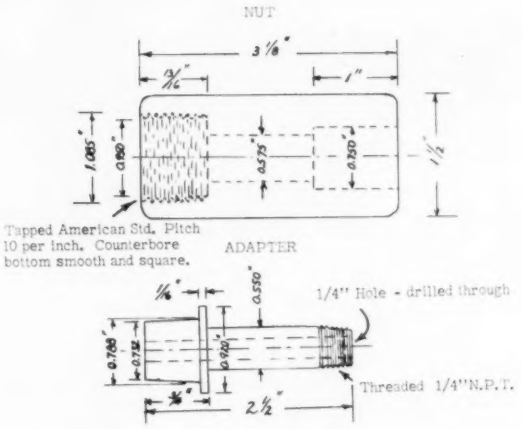
Cylinder Testing Adapter

J. H. Graham, Seattle, Washington—Here are details of a cylinder testing adapter to connect an air hose to the indicator cock of a cylinder being checked. Made as shown, it will fit practically all modern engines fitted with standard indicator cocks. If an engine has the old-style large cock, the dimensions will change but the principle remains the same.

We have found the adapter especially valuable in checking for cracked liners, for leaking exhaust or intake valves, and checking ring blowby. Use of a pressure gauge and a shutoff valve permits a comparative check of cylinders. Air is admitted, the valve shut off, and the rate of pressure drop noted. A word of caution: Be sure the piston is at TDC and men clear of the machine before turning on the air. It is possible to roll the engine if pressure is high enough.

With air pressure in the cylinder, cracked liners or leaking gaskets will show up as bubbles in the expansion tank. Where individual water outlets are used, these may be disconnected and the bubbles will show up there. Exhaust or intake valve leakage can frequently be detected by listening or felt. Blowby generally can be detected in the engine base by the removal of an inspection plate or door.

There are too many engine designs to be specific and the use of air for testing is fairly widely used. The adapter simply makes the application of the compressed air easier and quicker.



Assembly has two components. Adapter fits inside nut and tapered portion enters indicator cock as nut is screwed on. Air hose is connected to adapter with ¼-in pipe coupling.

As Mr. Graham says, the use of air for testing is well known and is a good way to locate certain troubles. It will often save a lot of bull work in pinning down a trouble to a specific cylinder. The adapter is a practical device well within the machining capabilities of the average repair shop. Note particularly his safety comment; it's an important one.—Editor

Taking Out Tight Pipes or Nipples

R. H. Oswell, Jr., Mobile, Alabama—Did you ever try to unscrew a short piece of pipe or a pipe nipple that was really in tight? It happens a lot in marine piping. And when you try it—right, it mashes flat when you put the power on the pipe wrench. Then you usually have to gouge or chisel it out.

A simple expedient is to select a bolt or short length of round stock (in marine shops like ours, a piece of propeller shafting is usually handy), that will nearly fit the inside diameter of the pipe or nipple. Drive it in to give support when the wrench force is applied. You will find that 99 times out of 100 your tight pipe or nipple will come out more easily and without any distortion or mashing.

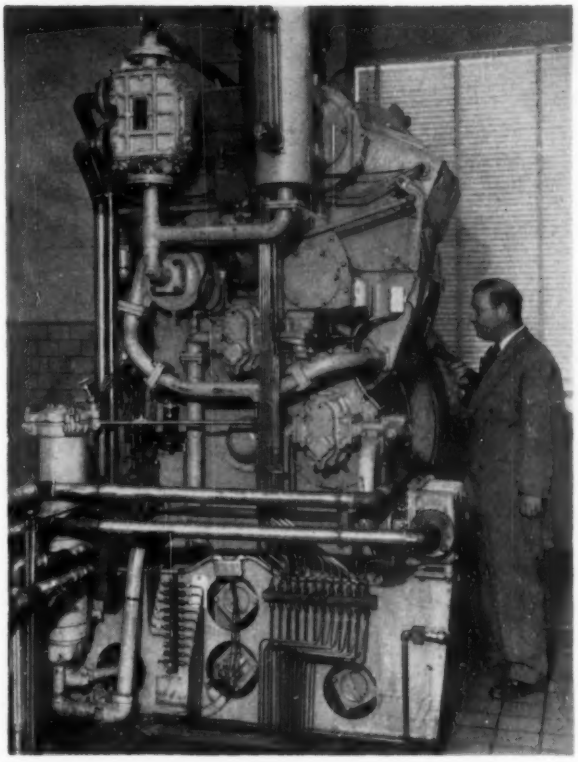
A simple enough idea and yet how often have you approached the problem with hope that you could get the pipe out without the trouble of providing a filler. Then, when the thing mashes with that little extra tug, you spend three or four times the amount of time getting it out the hard way.—Editor

news of our industry

Locomotive In the Labs

This 2-cyl diesel locomotive wasn't built to tug trains on the rails. Instead, it was "derailed" by Standard Oil Development Company's Linden, New Jersey laboratories for research designed to result in better railroad fuels and lubricants.

Research engineer N. H. Rickles is shown here inspecting the 27,000-lb special test engine which is the same height as a regular 16-cyl model, but one-eighth the length. It's manufactured by the Electro-Motive Div., General Motors Corp. Using this engine, the oil research firm can subject diesel fuels and lubes to the equivalent of 100,000 mi of heavy-duty railroad service in only a few hundred hours of testing in the labs.

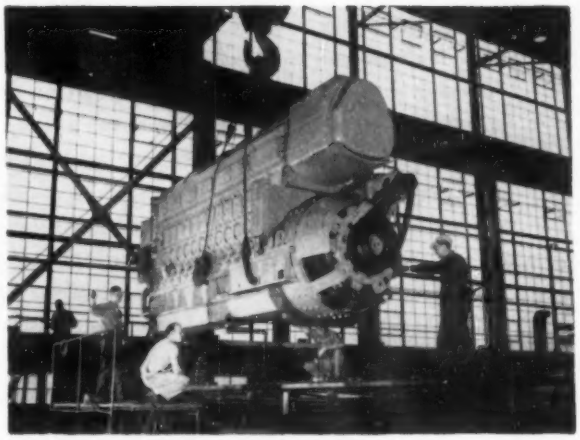


Educational Film—"O-P Horsepower"

Fairbanks, Morse & Co. tells the story of its famous opposed piston diesel engine in a new 20-min sound movie entitled "Opposed Piston Horsepower". Photographed in full color, the film shows the manufacture, installation, and use of the O-P engine in rail service. A special feature of the film is the use of a full-size sectionalized model of the engine to demonstrate the opposed piston principle.

Produced for the railroad division of F-M by Producers Film Studios of Chicago, "Opposed Piston Horsepower" is designed for use in instructional classes as well as for general informational purposes to all groups interested in diesel power.

The film is now available for booking free of charge (except for transportation both ways) from Modern Talking Picture Service, 140 E. Ontario St., Chicago 11, Ill. A scene from the Fairbanks-Morse movie showing the installation of a diesel engine on a locomotive underframe is reproduced here.



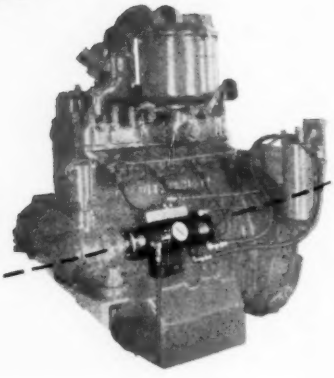
new products . . . . . page 64

new literature . . . . . page 68

organizational news . . . . . page 70

this revolutionary pump

makes good diesels better!



Perfected after 15 years of research and intensive field experience, the Roosa Master is a revolutionary development for better and simplified fuel injection. Performance-proven... simple... compact and lightweight, Roosa Master offers to both diesel engine manufacturers and users such advanced features as: built-in governor that gives extremely close speed regulation, built-in transfer pump, complete self-lubrication... plus the elimination of complicated springs, poppet valves, ball bearings and gears. Not limited on high speed applications and easy to service right in the field, Roosa Master pays big dividends (to your diesel customers) in high performance, low maintenance cost, and long life. For the very best in diesel engine performance, specify Roosa Master, made by one of New England's leading manufacturers of precision machined products. Complete information is available from the Hartford Machine Screw Company, Hartford 2, Conn., or your engine manufacturer.

ROOSA MASTER

THE MODERN FUEL INJECTION PUMP

news of our industry

American Bosch and Arma Merge

The integration of Arma Corp. into its parent corporation, American Bosch Corp., has been announced. The company is now known as American Bosch Arma Corp. with two divisions: American Bosch Div. at Springfield, Mass., and Arma Div. at Garden City, N.Y.

Directors of the corporation in their first meeting following the merger voted to promote two key executives and to continue all other officers in their capacities. David F. Devine was promoted to vice president—finance and Clifford A. Sharpe to vice president—operations.

Budd Expands Foreign Sales

Large initial orders for railway passenger cars have been received by two new foreign licensees of The Budd Co., according to H. A. Coward, vice president. The Commonwealth Engineering Co., Ltd. of Australia has an order for 80 coaches from the New South Wales government railroad and for two self-propelled rail diesel cars from the Queensland government railroad. La Brugeoise Nicaise & Delcuve of Belgium will build 40 cars for the Belgian state railways.

Mr. Coward, in announcing the new orders, stated, "Accelerated activity on the part of our foreign licensees is becoming an increasingly important facet of our overall operation. The combined backlog of all of our licensees abroad is 406 cars."

Under the arrangements, Budd receives royalties on all cars produced. Six manufacturers in France, Belgium, Italy, Portugal, and Australia use Budd's engineering and production methods. In addition, Budd has announced the purchase of a controlling interest in a major French railway car builder, Carel Fouçhe & Cie, which will act as operating headquarters for servicing all European licensees and will manufacture cars for French and Algerian railroads. Budd is also building cars for export at its Red Lion plant and has begun delivery on an order for 173 cars, the largest it has received, from the Canadian Pacific Railroad.

news of our industry

Packard to Develop Diesel Line

Packard Motor Car Co. announces it has set up a broad engineering project to develop lightweight diesel engines which will be widely acceptable in industrial and civilian uses. On an informal basis, discussions are being held with railroad officials relating to power possibilities for trains. The plans to expand development work are cited as representing a major phase of the company's current and long-range diversification program.

Packard has been producing marine diesels for the Navy since 1951, in 6-, 8-, 12- and 16-cyl models. Aluminum is used extensively in these engines to cut down weight. Market forecasters, according to the company, see lighter weight diesels as offering attractive operating advantages for industrial power applications, large trucks and buses, and for off-the-road vehicles.

Portable Service for Oil Rigs

Designed for emergency repair work on relatively inaccessible oil rigs, a new portable servicing plant has been put into operation near Clareton, Wyo., by the Western Oil Tool and Mfg. Co., Inc., dealer for General Motors' Detroit Diesel Engine Div. The idea of portable servicing was fostered by the transient nature of the drilling business over considerable distances in Wyoming's mountainous regions.

Many of the portability features found in present-day oilfield equipment were used. The plant was built in three sections to include a supply warehouse, a repair shop, and a power building. Each section resembles an oil rig's dog house, is mounted on a conventional oilfield type of skid base, and can be carried by a single truck. The sections are independently wired and rest on wood mats when in use, similar to those used for a drilling rig's substructure. A house trailer office travels with the three units. Power for the entire operation of the plant is supplied by a 60-kw GM diesel-electric set housed in one of the sections with a 1700-gal fuel tank.

STOP CREEPING WEAR

on your engines

Engine wear doesn't just happen all at once—it creeps up until suddenly inefficiency is noticeable and costly.

A Sharples Oil Purifier is your best protection against the slow death of efficiency caused by carbon, metal particles and water which finds its way into lubricating oils.

Sharples Oil Purifiers are easy to clean—just 10 minutes and you're back in service. Operation is continuous with minimum attention; no cartridges to replace. The tubular bowl can easily be lifted for cleaning—no hoist is required at any time.

To do the best oil purification job at lowest cost—use Sharples. Get the facts in Bulletin 1264.

And don't forget:
YOU CAN BURN BUNKER C IN YOUR DIESEL
SHARPLES
HAS THE ANSWERS AND EXPERIENCE

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new products

Single-Cylinder Gas Engine

Addition of a new 1-cyl gas engine to its Power Chief series of small diesels has been announced by the Nordberg Mfg. Co. Now in production at the firm's Milwaukee, Wisc. plant, the spark-ignition gas engine is built as a low-cost medium-speed unit for oilfield and any other small power application where natural gas is advantageously available.

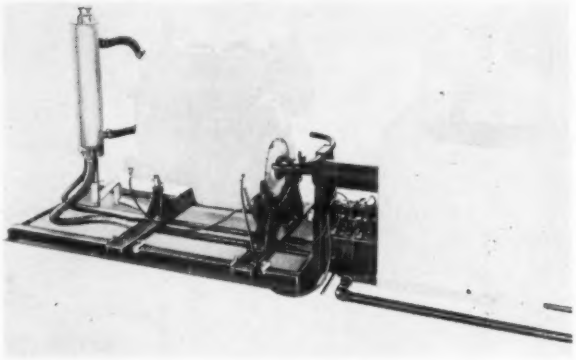
Rating for the new unit is from 9 to 18 maximum bhp within an operating range of 800 to 1800 rpm. It has a 4½-in bore and 5¼-in stroke and is of 4-cycle design. Introduction of the Power Chief gas engine is designed to meet the demand for an economical, reliable unit for production pumping, rig lighting power, etc., in oilfield service.

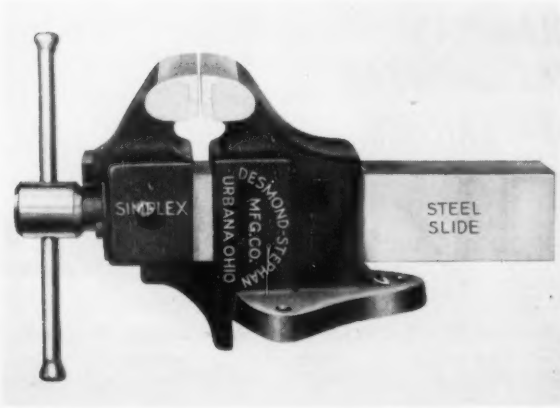
It is another unit in the extensive line of Nordberg 2-and 4-cycle diesel, gas, and dual-fuel engines in sizes from 10 to 10,800 hp. Additional information is available from local Nordberg representatives.

Engine Test Stands and Adapters

Clayton Mfg. Co., El Monte, Cal., has developed three new engine test stands with universal adapters for mounting engines of diverse sizes and types. The test stands are available in three sizes. Model A is for engines up to 200 hp, Model B for engines up to 600 hp, and Model C for engines up to 1200 hp.

One of the most important adapters available with the new test set is said to be the universal rear engine mount. A universal engine front mount is also available. Further details available from the firm—P.O. Box 550.





Machinists Vises

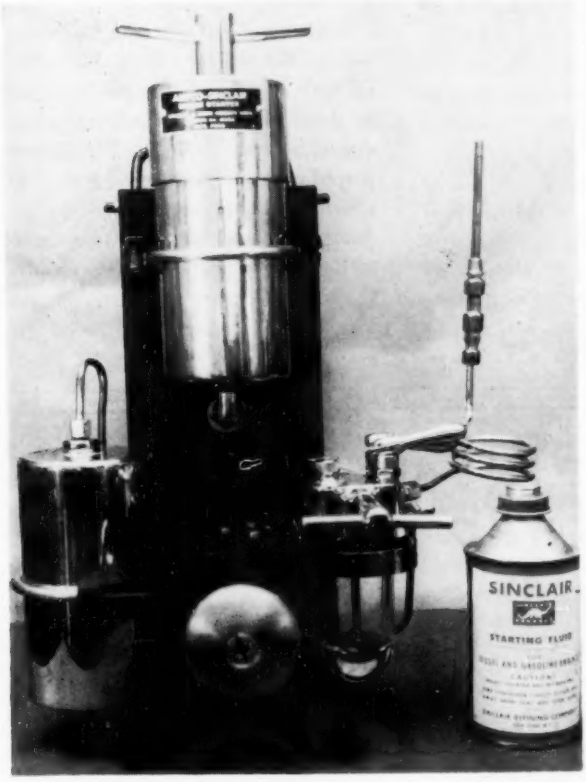
Seven sizes of stationary-base machinists vises are currently being produced by the Desmond-Simplex Mfg. Co. Jaw widths of the new vises range in size from 3¼ in to 8¼ in and jaw openings range in size from 5 in to 14 in.

The long, heavy base horn of this vise is designed to give added support to the vise body and also extra rigidity to the mounting on the bench. The stationary base-type offers the greatest stability for pounding and bending operations, according to the manufacturer. Additional data and prices are available from the company at 250 E. 43rd St., New York 17, N. Y.

Cold-Engine Starter

Ampco-Sinclair (Refining Company) has developed a self-contained pneumatic starting fluid applicator which operates on the "aerosol" principle and is designed for cold engine starting down to minus 40°F in 10 sec or less, according to the manufacturer. An air pressure regulating device of simplified design controls starting fluid input, making the operation one requiring little "know-how".

A bulk fluid reservoir holds a sealed volume of starting fluid which is released by the operator into a measuring and mixing chamber. This allows the applicator to operate identically each time it is triggered with a given air pressure.



The first control valve, between the hand-pressurized air tank and the mixing and metering control, passes air only and not fluid. An air bleed orifice and a fluid input orifice permit the transfer of a required charge of starting fluid for any engine by the release of the second control valve.

Starting fluid is discharged in spray form into the induction manifold of the engine through the use of a special nozzle or nozzles as required for even distribution and to avoid excessive pooling of the fluid in the intake system.

Production of the device has been projected to provide for delivery beginning during October. Detailed information is available from Automotive and Marine Products Corp., 87 Harvard Ave., Boston 34, Mass.

CATERPILLAR TRACTOR CO. SELECTS
DETROIT ENGINE THERMOSTATS
for the
big earthmovers!

Rugged, reliable, world renowned . . . that pretty well describes the familiar yellow Cat-built Machines. It's an apt description of Detroit Vernatherm Engine Thermostats, too. That's why Caterpillar Tractor Co., this year celebrating "50 Years On Tracks," specifies Detroit as standard equipment.

Detroit Vernatherm thermostats assure the accurate control of engine temperature necessary to maximum engine efficiency. These thermostats were pioneered by Detroit Controls Corporation to meet the requirements of modern pressurized cooling systems. Vernatherm engine thermostats will stay tightly closed against high pump pressures. Long, trouble-free service is provided by the specially developed temperature responsive compound used in Vernatherm thermostats to give powerful thermostat operation.

So take advantage of this advanced design and superior operation. If you're concerned with modern engine cooling and oil cooling systems for Diesel, heavy-duty gasoline or jet engines, Detroit Sales Engineers will welcome the opportunity to consult with you on your thermostat requirements.

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& WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS
ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

new products

Mack Contour Cab Tractors

Designed to haul the latest 35-ft. high-volume, square-front trailers in the 55,000- to 65,000-lb GVW range within 45-ft overall length, the new "Macksimum" contour cab tractors announced by Mack Trucks, Inc., 350 Fifth Ave., New York 1, N. Y., are corner clearance, even with kingpin basic "B" tractors with redesigned cabs.

The rear contour allows for trailer set as far as 18½-in ahead of the rear axle, while meeting legal requirements. Accessibility of standard counterparts are retained, with regular options of the company's line available. Diesel or gasoline power is optional; the 170-hp diesel having 672-cu in displacement and maximum torque of 480 ft-lb at 1200 rpm. The new vehicles are available in 5-speed and 10-speed transmissions, choice of front axles, and single or dual reduction rear axles which can be had with variety of final ratios.

New Fuel Oil Filter

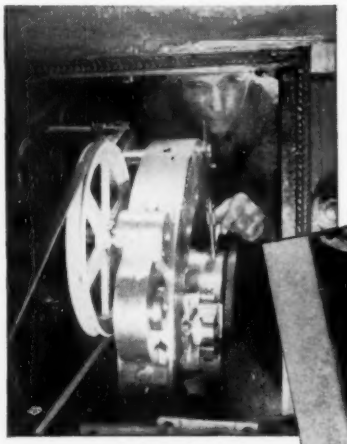
American Bosch Div., American Bosch Arma Corp., Springfield 7, Mass., announces it is now producing a new fuel oil filter for final-stage use on diesel engines. Designated Type FSA-10A-1, the filter is said to remove the last microscopic particles of dirt from fuel, which might cause wear on internal lapped surfaces of injection equipment.

The filtering element is said not to be affected by water in the oil. It is of sealed construction, and the filter contains a built-in check valve to prevent incorrect installation with reference to oil flow direction. It is said to have ample capacity for all medium-size truck, bus, and tractor engines and to be of special value in dusty areas. For larger industrial engines, two filters may be installed in parallel hookup.

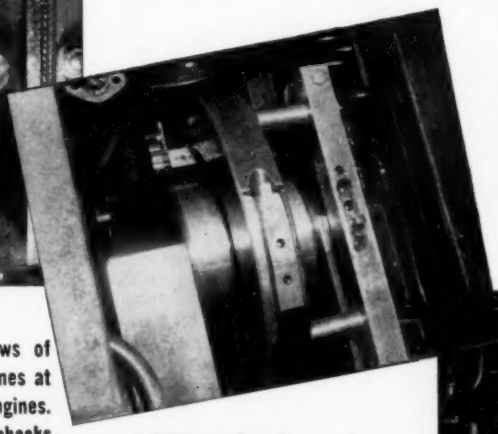
Vacuum and Instrument Valve

A new packless shut-off valve with solid Teflon diaphragm has been announced by The Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago 7, Ill. Identified as the Red Head, the valve is listed as adapted for vacuum applications, instrumentation, processing, pneumatic service, and similar instrument uses.

Because of its soft seat, the valve is reported to provide positive shut-off with easy finger-tip operation and is designed to withstand unlimited openings and closings. The Teflon diaphragm is chemically stable to resist all liquids and gases except fluorine, chlorine trifluoride, and molten alkali metals. The valve is recommended for pressure up to 300 psi. Temperature range is −100°F to +450°F.



CRANK PINS REFINISHED IN PLACE



For engines of practically any size our Portable Machines are available for quick and economical restoration of damaged crank pins. Let us help you minimize down-time.

Requests for the purchase of these machines have become so numerous we have decided to manufacture them for sale and invite your inquiries.

Above illustrations show views of our Portable Crank Pin Machines at work in various size marine engines. At right a marine engineer checks the accuracy of a refinished crank journal.

Additional information furnished without obligation

WASHINGTON IRON WORKS, INC.
Established 1876
SHERMAN, TEXAS

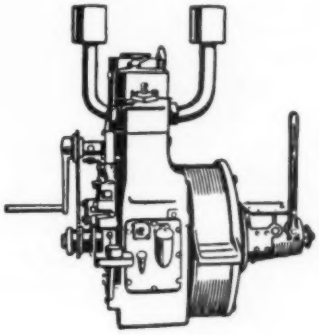
BUKH Diesel

YOU BET YOUR LIFE . . .

on the dependability of your lifeboat power. Recent submersion tests in New York harbor offered demonstrated proof that the BUKH Diesel runs smoothly and efficiently, and develops full power even while completely under water.

BUKH four-stroke cycle lifeboat Diesels are available in three sizes with outputs of 10, 20 and 30 horsepower, at 1500 r.p.m.

There is a BUKH 4-cycle full diesel tailored to suit your requirements for marine or land, stationary or mobile power. Fifty years of diesel experience is behind their outstanding dependability and economy.



BURMEISTER & WAIN AMERICAN CORPORATION

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BURMEISTER & WAIN AMERICAN CORPORATION

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new products

Tank Filler Couplings

To eliminate leaks at the fuel and water fillers while filling tanks on locomotives, Electro-Motive Div., General Motors Corp., LaGrange, Ill., has developed a new hose coupling equipped with a swivel locking device designed to mate with the half coupling on the tank fillers. A slight turn of the handles on the coupling sleeve is said to produce a tight leakproof joint between hose nozzle and filler.

In addition to eliminating leaks which induce fire hazards and increase maintenance costs, the swivel feature allows the hose to be easily attached from any angle. Male end of the fuel coupling is provided with a 2½-in straight pipe thread adaptable to all standard fuel nozzles. Male end of water hose coupling has a 2½-in fire hose thread adaptable to standard fire hose couplings. Female ends of both couplings are adaptable to all diesel-electric locomotives equipped with Protectoseal ¼-turn tank fillers.

Self-Centering Bore Gauges

George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y., announces a line of self-centering dial small bore gauges for checking size, taper, oval form, and bell mouth at any point and depth. A spring-loaded bridge, the cradle-shaped ends of which form an equal-sided triangle with the feeler head, centers the instrument automatically inside the bore.

Measurements are taken by inserting the shaft into the bore, rocking it around, and reading the dial. Movements of the contact points are transferred to the indicator. Setting of the instrument to the true diameter to be checked is said to be best done with a stack of gauge blocks clamped in a holder between a pair of caliper jaws. Where a few diameters only are to be checked, setting to ring gauges are recommended as simpler. In the absence of ring gauges, micrometers or snap gauges may be employed.

Automatic Air Filter

Announcement of a new "pulse-action" automatic air filter has been made by Air-Maze Corp., 25000 Miles Rd., Cleveland 28, Ohio. The filter features a traveling curtain of metal air filter panels which is automatically cleaned and then coated with adhesive. Air cleaning efficiency is thus said to always be at a maximum and air resistance at a minimum.

A new type of actuating mechanism consisting of an air piston and an overriding clutch provides positive action. This is said to eliminate shear pins and alignment problems, without having any electrical connections in the air stream. Full description is available in catalog AMC-1253.

new literature

Government-Owned Inventions

To encourage industry to take advantage of the products of government-sponsored technical research, publication of a volume listing 775 government-owned inventions in the field of instrumentation has been announced. Entitled "Instrumentation," the book may be obtained for $2 from the Office of Technical Services, U.S. Dept. of Commerce, Washington 25, D.C.

These inventions are available to the public on a royalty-free license basis. The book gives a brief description of each invention, including patent number, title, name of inventor, and the government agency administering the patent. Several specific inventions of commercial application are cited to indicate practical value of the book.

One is a process for testing embrittlement characteristics of solutions. Others include a device for detecting radioactivity, a fluid-selecting apparatus for handling corrosive liquids, a pocket radiation alarm, a pocket radiation meter, a humidity measuring device, a remote control manipulator, a detector for carbon monoxide, and a pressure measuring device. The volume is the first of a series of seven scheduled for publication this year.

Industrial Safety Standards

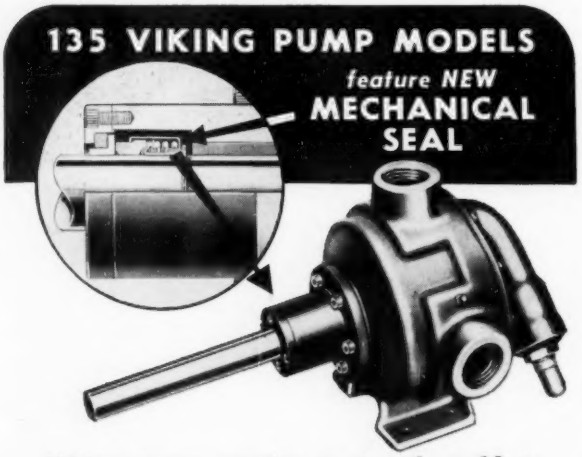
A classic in its field for 30 years, the "Handbook of Industrial Safety Standards" is now available in completely revised edition, the Assn. of Casualty and Surety Companies announces. The new ninth edition is 50% larger and includes several new chapters, illustrations, and tables in its 315 pages.

The handbook is a comprehensive compilation of safety requirements recommended by authorities such as the American Standards Assn., the National Fire Protection Assn., and the American Society of Mechanical Engineers. New chapters include welding and cutting, storage and handling of flammable liquids, radiation hazards, and disaster control. Available from the association at 60 John St., New York 38, N. Y., it sells for $1.40 per copy.

Work Kit for Lift Trucks

Yale & Towne Mfg. Co., Philadelphia 15, Pa., is offering a work kit which will enable plants to apply fork lift truck standard performance data in predetermining the times necessary for trucks to perform specific operations.

Typical materials handling examples are included in the kit to demonstrate standard technique for application of the data, as well as charts for basic truck motion elements. Also contained are work sheets to be used in evaluation of standard performance times for specific operations.



Viking pumps, ranging in sizes from 10 to 300 gpm, are now available with new Viking leak-proof mechanical seals. These same pumps are also equipped with bearings requiring no outside lubrication whatsoever.

Both features are available on regular line of pumps, all-weather single and twin units and Underwriter's approved models. See what these latest lines of Viking pumps can do for your pumping problems. Ask for bulletin 3P-336D today.

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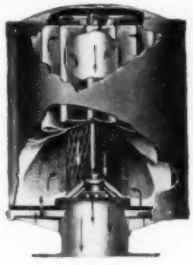

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new literature

Desulfurization Process

Autofining, a desulfurization process developed by the Anglo-Iranian Oil Co., Ltd., is the subject of a new bulletin just published by The M. W. Kellogg Co., 225 Broadway, New York 7, N. Y., engineering-contracting subsidiary of Pullman Inc.

According to the bulletin, the process has been applied successfully to straight-run petroleum distillates in the gasoline to diesel fuel range. Kellogg is a licensor for the process. The catalytic process is said to be capable of slashing sulfur content in sour middle distillates while holding liquid product loss to less than 1%.

Steps Toward Automation

"Five Steps to Productive Maintenance" is the title of a new publication available from General Electric Co., Schenectady 5, N. Y. The 18-page bulletin provides detailed information on organizing to meet the demands that increased mechanization will make on a plant's electrical maintenance program. With automation, it is stated, keeping production flowing will be shifted from the production worker to the maintenance worker.

The five principles of the program discussed are as follows: (1) gathering equipment data, (2) determining extent of routine maintenance, (3) establishing a routine operating control system, (4) evaluating for critical maintenance, and (5) establishing a critical maintenance program.

Properties and Uses of MoS_2

"Lubrication Properties and Industrial Applications of Pure Molybdenum Disulfide", a 4-page reprint of a technical paper presented before the American Society of Lubrication Engineers, is available from The Alpha Corp., 179 Hamilton Ave., Greenwich, Conn.

In the paper, a new concept of lubrication by solids is discussed, according to which extreme pressure or boundary lubrication without participation of solid lubricants is impossible. It is held that thin oxide films form on most metals almost immediately after cutting, which act as lubricants and reduce friction by substantial amounts. This can be improved by alloying or supplementing them with more highly qualified solid lubricants, which is the role claimed for molybdenum disulfide.

Power Control Linkage

Now available from Twin Disc Clutch Co., Racine, Wis., is a reference guide for users of powered equipment driven by internal combustion engines or electric motors. It is offered as a quick guide to the complete line of power control linkage for industrial applications manufactured by the company.

Information is given on fluid drives for engines from ¾ hp to 850 hp, friction and power take-offs for engines up to 1325 hp, torque converters for engines of from 40 hp to 650 hp, and the complete line of marine gears to meet requirements in the 40-hp to 340-hp range.

organizational news

Buda Sales Manager

Mr. C. L. Thompson has been appointed sales manager of the material handling division of The Buda Co., Div. of Allis-Chalmers Mfg. Co. He was formerly general manager of the Oregon branch of the company and before that assistant general manager of the California branch.

Mr. Thompson will plan, administer, and manage the sales expansion program for fork lift trucks, industrial tractors, and Chore Boys. He joined Buda in 1952 and prior to that was closely identified with the postwar growth of the aluminum extrusion and tubing industry.

C. L. Thompson

Joy Elevates Vice President

The election of John Lawrence as executive vice president has been announced by Joy Mfg. Co. He will give special attention to further diversification of the company's product lines.

Mr. Lawrence joined the company in 1951 as vice president of manufacturing and in 1953 was named vice president of manufacturing and engineering. His prior experiences include seven years with SKF Industries Inc. as vice president and 10 years with Jones and Lamson as factory manager.

Purolator Representative

B. E. Searle has been appointed by Purolator Products, Inc. to assist in development of a new water and industrial filtration program, the company announces.

Mr. Searle has been associated with Worthington Corp. for the past 21 years as sales engineer in charge of the Wisconsin and upper Michigan area. Before that he was with Allis-Chalmers.

B. E. Searle

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Throughout the diesel industry, Tuthill Model L pumps are recognized for their dependability in fuel transfer and hydraulic governor service. Model L is a mechanically-sealed, positive displacement internal-gear rotary pump, assuring quiet, leak-free operation with low power consumption. Capacities from .33 to 6 g.p.m. in wide pressure ranges. Available as single or double-pump units. Write for Catalog No. 101 including Pump Guide for diesel applications.

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organizational news

Sales Expansion at Enterprise

The initial phase of an extensive sales expansion program has been completed at Enterprise Engine & Machinery Co., subsidiary of General Metals Corp. The action involves broadening of product lines and development of new products, increase of the national sales staff, and a large increase in the 1955 advertising program.

In the production category, the company will build power units up to 5000 hp, the largest ratings up to now being in the 2700-hp class. Engine efficiency is being improved as well. New products are still in development stage.

The national sales force has been increased by five. George M. Anger, Allen H. Hogue, and Robert Hills will operate as sales engineers out of the San Francisco office. Roy E. Hoffman will head the new Jacksonville, Fla. office, and R. T. Bauman has been added as a sales engineer to the Boston staff. In addition, George A. Cashman, sales engineer in San Francisco, will be transferred to Seattle. Other sales engineers will be added in the near future.

G. M. Anger

R. Hills

G. A. Cashman

A. H. Hogue

Sealed Power Changes

Charles H. LeFevre has been appointed sales manager of the replacement sales division of Sealed Power Corp. to succeed John E. Norwood. He has been with the firm since 1935 in sales and advertising. He was named assistant advertising manager in 1943 and advertising and sales promotion manager in 1945.

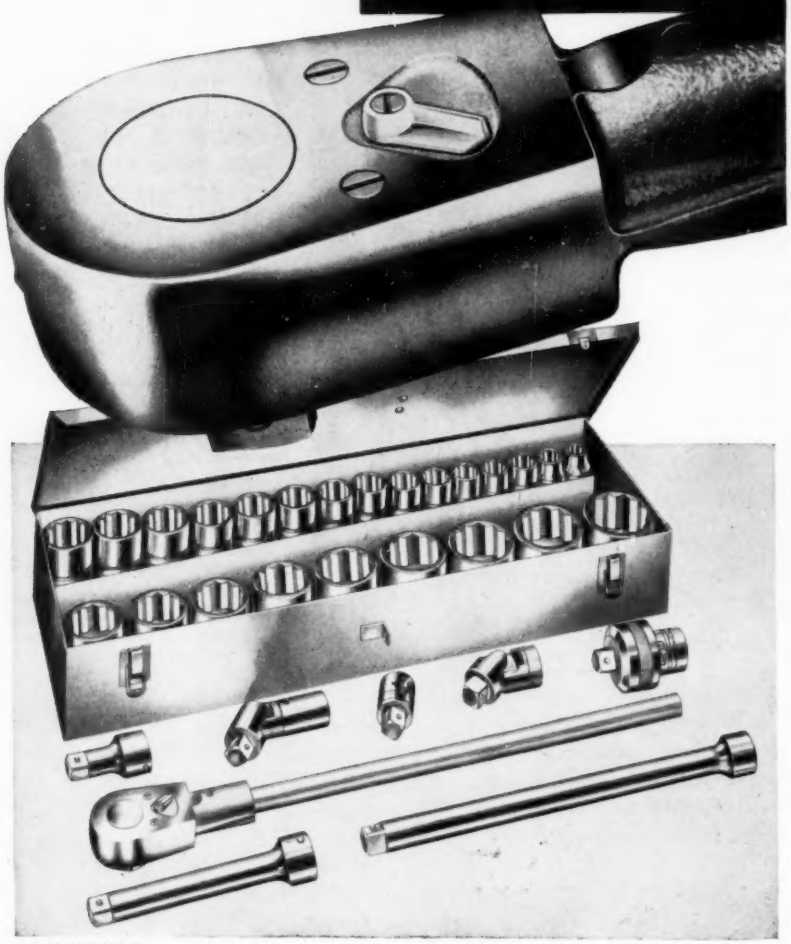
Mr. Norwood, who occupied the post of sales manager since 1943, has taken over the position of advertising and sales promotion manager. He has been with the company for more than 35 years and has had extensive experience in the automotive replacement industry.

Ed Gray has been appointed an assistant sales manager. He started with the company as a zone manager in 1933, worked on special sales assignments, became Philadelphia district manager in 1946, and southern regional manager in 1952.

Edward S. Schulze has also been appointed an assistant sales manager. He joined Sealed Power in 1946 as a zone manager, was appointed New England district manager in 1949, and advanced to central regional manager in 1952.

Snap-on*

HEAVY DUTY LOXOCKETS



SET 432-HD-B

POWER FOR THE TOUGH JOBS! This is the wrench set to have at hand for the jobs that require size and power and sweeping leverage. These tools give *speed* as well—the big handles, adaptors and sockets are sleekly proportioned, versatile and fast working. The more powerful the wrench, the more you want *safety*—and Snap-on provides it—with positive button locking of units to give the security of a one-piece tool. The Loxocket release pin gives fast interchangeability of units. Available through your nearby Snap-on factory branch. For Snap-on industrial catalog, and 104-page general catalog of 4000 hand and bench tools, write

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BOOK REVIEWS

Engineering Analysis—by D. W. Ver Planck and B. R. Teare, Jr.; John Wiley & Sons, Inc.; New York, N. Y.; 344 pages.

This book is offered as an aid to the teacher of courses in engineering analysis. Major objective is the development of the student's capacity to deal with new situations by the application of fundamental principles on his own initiative, which requires the same kind of thinking he will encounter in his professional career.

To stimulate thinking, the book features a collection of problems with no clue given as to method of solution. Included are considerations of different ways of handing various parts of each problem, the consequences of making particular choices, ways of checking, understanding and interpreting results, and the different decisions that may be made.

The book is basically an exposition of professional methods as it applies to the analysis of engineering problems in electrical and mechanical engineering and industrial management. The form in which analyses are presented is that which an engineer might use in his own notebook. Relatively simple and general principles and techniques are employed to suit a student background.

Weldability of Steels—by Robert D. Stout and W. D'Orville Doty; Welding Research Council; New York, N. Y.; 381 pages.

Ever since its creation in 1936, the Welding Research Council has sponsored research programs of interest to the industry. Research on weldability of steel in the early days was concerned primarily with the effect of welding proper, but as work progressed it became clear that the problem also involved the basic and metallurgical characteristics of steel as well as important elements of structural design.

Because of the many facets of the problem and the multitude of individual research projects necessitated, it was felt that a project to assemble, study, and condense these research

findings into one volume which would summarize and interpret the broad general results of the investigations was needed. This monograph is the result of the difficult task. It is aimed at the solution of problems fundamental not only to the industry but to all related steel processing and fabricating industries.

The first chapters cover the principles of welding processes and metallurgy. Following that are considerations of the basic factors influencing weldability of carbon and low-alloy steels, with suggested methods for welding commonly used steels. The remaining chapters contain a review and critical evaluation of weldability tests and general conclusions on present knowledge of weldability.

Lubrication of Industrial and Marine Machinery (2nd rev. ed.)—by William Gordon Forbes, C. L. Pope, and W. T. Everitt; John Wiley & Sons, Inc.; New York 16, N. Y.; 351 pages; $6.50.

Addressed to the man responsible for the maintenance of mechanical equipment, the purpose of the book is to provide a manual that may be used to explain the fundamental characteristics of conventional lubricants. It interprets in detail the chemistry, refining, compounding, and specifications of the subject and expounds on the limitations to which certain types of lubricants can be extended.

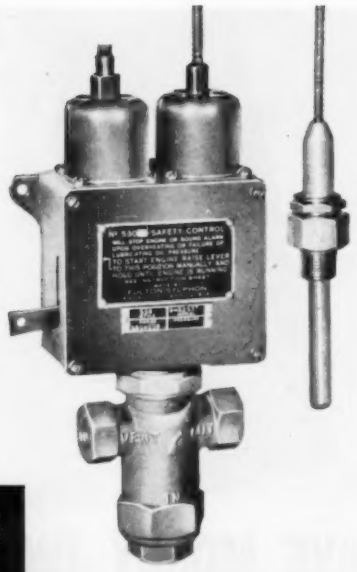
Basic mechanisms such as bearings, gears, pumps, and compressors are detailed, and integration of the lubricating principles with the lubrication requirements of mechanisms are made to enable the solving of lubrication problems.

Effort has been made to present the various discussions simply without using mathematical analysis and theories. Topics are arranged in sequence, from the structural nature of lubricants to their practical applications to equipment. Since the first edition of the book in 1943, developments in the field have necessitated the addition of new material and revision of some practices in light of present knowledge.

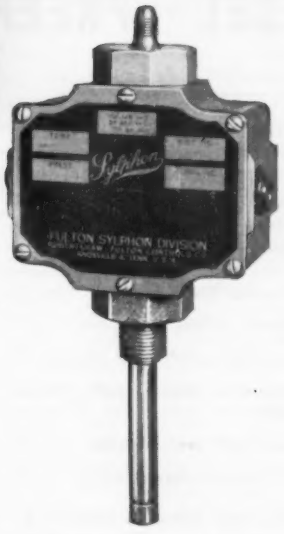
No. 530

Automatically stops the engine

. . . if cooling water temperature goes above, or lube oil pressure goes below safe limits. This Sylphon Safety Control No. 530 will shut down small diesel engines direct and sound alarm, or serve as pilot valve to stop gas engines.



These Sylphon controls give automatic protection against lube or cooling failure in engines



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Automatically sounds an alarm

. . . if water jacket temperature goes above, or lube oil pressure goes below safe limits. Or, this No. 539 Temperature-Pressure Switch will flash a warning light . . . or, if desired, shut down engine operation. "Fail-safe" feature.

Low in cost, easy to apply, completely reliable, these Sylphon controls will stand constant guard over valuable internal combustion engines. With them, you are protected against the two most frequent causes of costly shutdowns and damage . . . cooling failure and lubrication failure.

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THIS illustrated booklet contains a wealth of sound, practical ideas to expedite Diesel maintenance, keep operating costs low and extend equipment life. Gives details on such subjects as:

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new products

Dual Control for Compressors

Selection of the most economical compressor operation for both continuous or intermittent air requirements is offered with a new dual control announced by Quincy Compressor Co., Quincy, Ill. When compressed air demand is high, the control is set for continuous compressor operation. The VD unloader unloads the compressor when maximum tank pressure is reached and compressor then idles until additional air is required.

For reduced air requirements, the dual control can be set to operate the compressor intermittently. A pressure switch shuts off the compressor motor when required tank pressure is reached and starts it when more air is required. The control, it is stated, can be added in the field to any Quincy unit equipped with loadless starting.

Electro-Magnetic Flow Meter

A new type of flow meter for liquids is being produced by Bowser, Inc., Ft. Wayne, Ind. Known as the Xactronic, it permits measurement of a great variety of conducting liquids, with high pressures, temperatures, or concentration of suspended matter said to present no obstacle.

Metering element consists of an enclosed-magnet, stainless steel tube with attached electrodes connected to an indicator installed at any desired location. There are no moving parts. Limit of accuracy is rated at one per cent of full-scale reading. Instrument scale is linear. The meter may be used to indicate quantity of fluid, rate of flow or both, and may be used with a controller to control rate of flow.

Portable Winch Hoist

The Lug-All Co., 331 E. Lancaster Ave., Wynnewood, Pa., announces that its winch hoist has now been equipped with a new and more rugged main frame to permit use of the lightweight unit for more applications. The ratchet teeth are now protected from rough surfaces by the new frame.

The unit weighs under 9 lb, but it can handle up to 1½ ton and is equipped with a reversible safety handle that will bend when extreme overloads are applied. Loads are said to be backed off easily and safely due to interlocking pawl arrangement. It has stainless steel springs, oiled-for-life bearings, and a 133-strand flexible preformed aircraft cable that winds on the drum and out of operator's way. Among its uses are pulling engine cylinder heads, pulling cables through conduit, lifting and installing motors, etc.

Power and Speed Control Units

To meet specific needs of fractional horsepower drives, a line of combination power and speed control units has been developed by the Dynamatic Div. of Eaton Mfg. Co., Kenosha, Wis. The units are an integral combination of AC constant speed induction motors, eddy-current couplings, and electronic speed controls, adaptable to applications needing closely controlled adjustable speeds.

A simple connection to a standard single- or 3-phase electrical power line is said to be all the wiring that is required. Electronic control is of simple design and constructed with minimum of components. The Adjusto-Spede Drive, as it is called, weighs less than 50 lb and is designed for various types of mountings without modification.

Parts Cleaning Machines

New models of Turbo-Blast parts cleaning machines have been announced by Storm-Vulcan, Inc., 225 Burbank, Dallas, Tex. Models range from 20-gal to 2300-gal solution capacity for applications in cleaning, degreasing, and stripping.

These machines are said to thoroughly clean everything from engine blocks to nuts, bolts, and small parts with no recessed areas left uncleaned. They are equipped with impellers which create a violent scrubbing action and some models have baffle plate covers for agitation with 2-layer stratified cleaning materials. The units are heated by steam, fuel oil, natural or manufactured gas, and are thermostatically controlled.

new products

Portable Vibration Analyzer

International Research & Development Corp., 168 E. Hosack St., Columbus 7, Ohio, is producing a portable electronic vibration analyzer said to be capable of balancing rotating parts moving up to 5000 rpm, and of tracing any vibration up to 20,000 cpm.

The instrument weighs 24 lb. It balances with the aid of a stroboscopic lamp having a range up to 5000 flashes per min. The part is balanced while running at design speed in its own bearings.

Analysis is accomplished through electronic frequency and displacement circuits which render data on panel members. Accuracy to 10% is claimed. The analyzer includes the stroboscopic lamp, a seismic pickup with direct and filtering-type probes, and a cabinet housing the circuitry, tubes, relays, etc.

Compressor for Air Tools

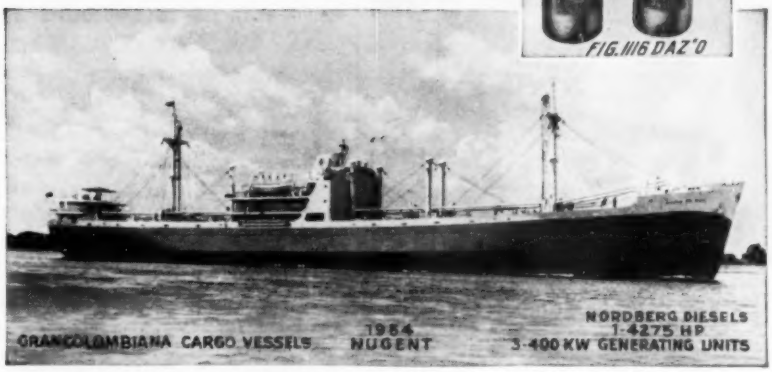
A new compressor, Model HT-325, designed for mounting in service trucks, is available from Quincy Compressor Co., Quincy, Ill. The compressor supplies air for inflating tires and for operating lubricating equipment, pneumatic wrenches, and other tools. It has a gasoline engine which is started with a pull rope or electric starter powered by the truck battery.

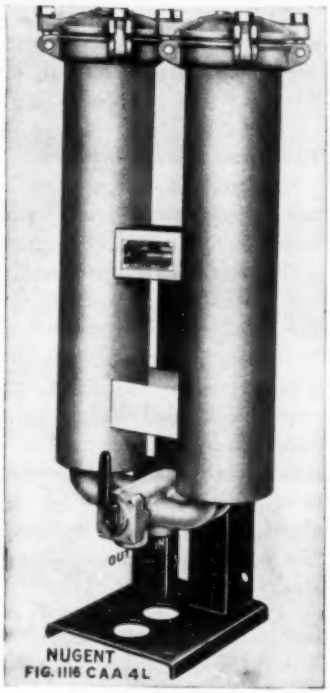
A tank outlet manifold supplies reduced air pressure for tools and full pressure for other requirements. Pressure is automatically maintained by a constant speed unloader. Maximum continuous pressure is 175 psi. Compact design of the unit is said to permit mounting in the smallest pick-up truck.

Deep Well Pump Drive

Any ratio, up to 5:1, is said to be attainable with the flexible deep well pump drive, PR-12, just introduced by Universal Gear Corp., 1452 E. 19 St., Indianapolis 7, Ind. Designed for connection of engines to deep well pumps, the drive may be used either as a speed reducer or increaser. Horsepower capacity is 50 to 450.

NUGENT
FUEL OIL FILTERS





Shown above is a Nugent Duplex Fuel Oil Filter of the type installed as original equipment on the propulsion diesels serving the Flota Mercante vessels. Recharges are inexpensive bag type — easy to replace.

Original Equipment for Merchant Fleet

SHOWN above is the Ciudad de Cali, one of the newest in a fleet of Cargo ships built for Flota Mercante Grancolombiana, S.A. Each of these vessels is powered by a 4275 shp Nordberg Marine Diesel equipped with a Nugent Fig. 1116 CAA#4 Duplex Fuel Oil Filter. Auxiliary power on each of the vessels is supplied by a Nordberg Supercharged Diesel Generating Unit equipped with a Nugent Fig. 1116 DAZ#0 Duplex Fuel Oil Filter. The Grancolombiana installations are still another example of Nugent filters being included as original equipment by a leading diesel manufacturer.

By actual test, Nugent filters of the above types remove 99.8% of all foreign solids from the fuel oil supply. With either model, the duplex units can be operated in parallel; or one at a time to allow cleaning without interrupting operations. Slow manipulation of the valves will not cause stoppage or high pressure. These are only a few of the reasons why Nugent Filters are selected as original equipment by leading diesel engine manufacturers.

Write for complete information on how Nugent can solve your own fuel or lube oil filtering problems. There is a Nugent Filter of the right size and type for every job.

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DATA SHEET NOW

THE BRIGGS FILTRATION COMPANY
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new products

Speed Reducers

The new "C" line of worm gear speed reducers developed by Winsmith, Inc., Springfield, N.Y., to provide greater capacity within more compact dimensions, consists of three new designs in 13 sizes each. The first five sizes, 1/100- to 5-hp range in ratios of 5:1 to 60:1, are now available. The balance is scheduled for early production.

The new reducers are equipped with gears, bearings, and shafts rated for AGMA Class 1 service. Housings are of 1-piece construction, reinforced to secure mounting for vibrationless operation. Detailed information and specifications are available in Bulletin HW 654.

Tube and Plate Fin Core

Monofin, a plate-type fin and round tube core made up of seven fins per in and said to provide 58% more extended surface and seven times more heat transfer surface than circular fin cores, is being manufactured by Young Radiator Co., Racine, Wis.

The core is designed for engine cooling units, and for oil-, gas-, and compressed-air cooling and is available in various metals for different types of services. Tubes are removable when damaged to maintain full heat transfer efficiency of entire core area.

Gar Wood Designs Huge Ditcher

Gar Wood Industries, Wayne, Mich., announces that it is designing "the largest ditching machine in the world", capable of digging a 15-ft wide and 30-ft deep ditch. The ditcher, Buckeye Model 435, will be used to excavate intercepting and outfall sewer trenches, water diversion aqueducts, etc., and will sell for about $100,000.

The machine will be crawler-mounted at the digging end and supported by rubber-tired wheels in front. Two diesel engines with torque converters will supply power to the crawlers and the digging drive. Hydraulic steering power will also be included.

Overall approximate dimensions of the vehicle will be 81-ft long, 15-ft wide, and 12-ft deep, excluding the dirt discharge conveyor. Its estimated weight will be 65 tons.

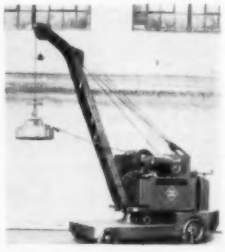
Liquid-Level Measure

Development of a "differential converter" to measure the level of liquids in a closed tank, either under pressure or vacuum, was announced recently by the Industrial Div. of Minneapolis - Honeywell Regulator Co., Wayne & Windrim Aves., Philadelphia 44, Pa. The new instrument converts differential pressure into proportionate air pressure, which is transmitted to indicators, recorders, and controlling equipment.

Small and lightweight (28 lb net), the instrument utilizes a pneumatic balance weigh-beam system. Range is adjustable in field applications from O-14 to O-200 in of water. Level reading over entire measurement range is continuous and the unit is said to be able to withstand temperatures up to 350°F and is rated for 750 or 1500 psi.

6000-Lb Capacity Crane Truck

Designed for transporting hard-to-manage loads in confined areas and to reach into inaccessible areas, a 6000-lb capacity crane truck has been developed by The Elwell-Parker Elec-



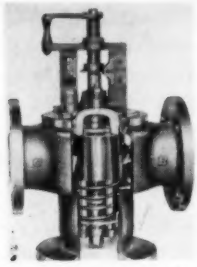
tric Co., 4205 St. Clair Ave., Cleveland 3, Ohio. It is equipped with a gas- or diesel-electric generating unit.

The crane has a slewing action to facilitate handling on either side of travel area. A separate motor drives a grooved drum through worm and planetary gear reduction. An electric limit switch stops travel at extreme limits. It has a telescoping boom with built-up heavy channel which measures 12 ft 6 in telescoped, and 19 ft 2 in extended. Travel speed of 4 mph is obtained without load and 3½ mph with full load.

new products

Temperature Regulators

Changing over from conventional liquid- or gas-filled thermal elements, the Fulton Sylphon Div. of Robertshaw-Fulton Controls Co., Knoxville, Tenn., is offering new temperature regulators containing a solid, wax-like compound. When subjected to



heat, the special compound melts and expands. It returns to solid state after cooling.

Because they contain these units, called Power-Pill, the new regulators are claimed insensitive to internal pressures of the system in which they are installed. They are also smaller in size and said to be lower in cost. Each regulator contains from one to four of the units, depending upon size of the valves, which are available ranging from 2 to 6 in.

Temperature settings range from 120°F to 190°F in 10-to 15-deg increments and may be altered by changing Power-Pill units. All repairs, parts replacement, and adjustments can be made without removing the valve from the pipe line, it is stated. The regulators are for use on engines and other temperature control applications. One of them is equipped with a manual operator for overriding the thermal element in special situations and for emergency use.

Cylindrical-Type Strainer

Wm. W. Nugent & Co., Inc., 410 N. Hermitage Ave., Chicago, Ill., has designed a cylindrical-type strainer employing a wire mesh basket for use on heavy oils and other viscous liquids that do not affect steel or stainless steel.

Available in nine sizes, the strainer has a capacity range of from 6 gpm to 7050 gpm when handling oil of 100 SSU viscosity. Flow of liquid may be in either direction through the strainer, but the manufacturer recommends from outside in on the smallest strainer and from inside out on the larger models.

Cold Immersion Solvent

For decarbonizing and paint stripping at engine teardown and overhaul, The Curran Corp., Lawrence, Mass., has developed a self-emulsifying diphase solvent which works by cold immersion. It is claimed to remove quickly in one operation carbon tars and varnish, burned oil, sludge, and grease.

Immersion periods for cleaning require from 10-60 min for light deposits and up to 8-12 hr for very heavy cokey deposits. A 3-yr service life for the compound is estimated since the only losses said to occur are through dragout. A competitive guarantee is offered.

Powdered Iron Bearings

Keeping to its policy of manufacturing every type of sleeve bearing, Johnson Bronze Co., New Castle, Pa., is now making powdered iron bearings and structural parts. Initial experiments had been started on the new line over two years ago.

Low-cost, good resistance to pounding and wear, self-lubrication, and close tolerances are offered to the manufacturer. Complete technical data is said to be available.

Diesel-Powered Fork Lift

The Buda Co., division of Allis-Chalmers Mfg. Co., Harvey, Ill., announces development of a new model pneumatic-tired fork lift truck, the FTPD40-24. It is powered with a Buda 4-cyl, 40½-hp diesel engine, Model 48D-153. Engine parts are said to be 85 per cent interchangeable.

The truck is rated at 4000-lb capacity at a 24-in load center. Features include front-vision instrument panel, automotive-type single-lever gear shift mounted on steering column, finger-tip flip-over parking brake, quick-change heavy-duty clutch, and center-point steering. It may be obtained in five standard mast heights with lifts of 72-, 84-, 108-, 114- and 120-in. Torque converter is available at additional cost.

How much of your engine maintenance bill is due to repair of breakdowns that could have been avoided—*if you'd had advance warning?*

At a fraction of that cost, Alnor Exhaust Pyrometers offer you a constant check of engine performance—advance warning of

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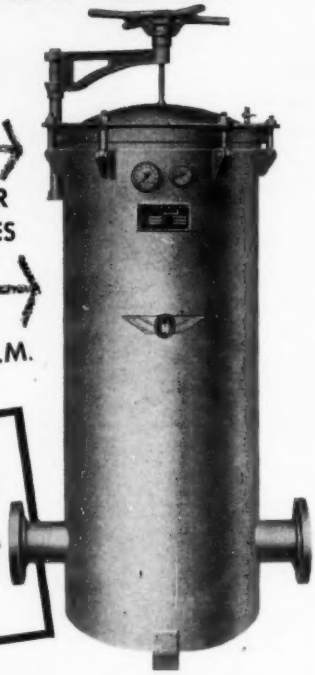

Only full-flow filtration that keeps your lube lines clear of the smallest abrasives can fully protect bearing surfaces from serious damage. Only Hoffman Flomaster gives you these exclusive features assuring that protection:

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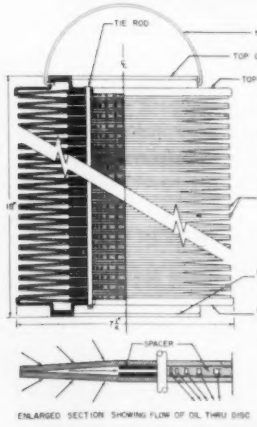

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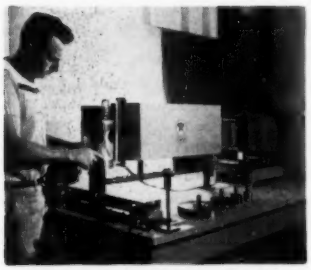

Camera Speeds Piston Studies

A mounting which permits a camera to photographically peel off the surface of a piston without optical distortion is being used in engine studies at the main research center of The Texas Co. The device works somewhat on the principle of a panoramic camera which rotates as it scans the subject during exposure. However, in this case the camera remains stationary and the subject moves.

Shown here, the operator is preparing to photograph a diesel piston in a lubrication study. The piston revolves on a platform which travels at right angles to the long axis of the rig. The camera scans the surface of the piston through a narrow vertical slit in a long box. Construction of the rig permits the aperture to travel in step with the piston, cancelling out the motion. By slightly modifying the motion controls, internal surfaces of bearing shells may also be photographically unwrapped.

World Solar Energy Symposium

First activity of the Assn. for Applied Solar Energy, formed this spring by some 40 Southwesterners, is a world symposium on applied solar energy to be held in 1955 at Phoenix, Ariz. It will bring together scientists and industrialists to evaluate present knowledge and to explore practical applications. Other means of advancing knowledge of solar phenomena are also being considered.

The symposium will be under the chairmanship of Lewis W. Douglas, former ambassador to Great Britain. Points to be considered will be the use of solar engines to pump irrigation and drinking water, the conservation of water through accelerated culture of algae, lengthening the plant growing season through better absorption of solar radiation, and development of new sources of animal and human food.

The construction industries will report on solar energy use for heating water, space heating and cooling. The equipment industry is considered in sessions on design and construction of sun-operated pumps, heat collectors, solar stills, and chlorella culturing equipment. Scientists active in fuel and power research will discuss possibilities of producing electric power directly from solar radiation. They will also consider the production of fuel gas from plant matter grown in special culture vats or from photo-chemical decomposition.

One Diesel for Two Steamers

A diesel efficiency story attested to by American Creosote Works, Inc. of Louisville, Miss., has resulted from the repowering of a 40-ton locomotive crane. A single, comparatively small diesel engine has replaced two steam engines, reducing operating costs and increasing daily work output. The company uses the crane to stockpile railroad ties and other products in its wood-preserving operations.

M. C. Miller, company manager, reports that even though the crane formerly required separate engines on the swing and hoist, the single diesel now powers both, speeding up operation by 20 per cent and reducing operating cost by 50 per cent.

Problems arising from the crane's original 2-engine design were worked out by engineers of the Lewis-Diesel Engine Co. of Memphis, Tenn. through the use of a General Motors 6-cyl, Series 71 diesel.

Penn Plans New Building

Penn Controls, Inc. announces that it will erect a new engineering and research building on the site of its present main office and plant in Goshen, Ind. The building will house engineering offices, library, drafting room, laboratory, and model shop. The laboratory will provide new facilities for more advanced development in many types of automatic controls, including advanced electronic research.

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news of our industry

C.A.V. Name Stirs Interest

A good indicator of the appeal of a magazine is the number of letters received after each issue. It makes us proud to know that whenever our readers are bothered about something in the field, they turn to us. We feel it is our duty to hustle up the answers. Our RBI average so far has been good, we must admit, until the other day when a simple item stopped us at first base.

We had been going along on the theory that our policy to use abbreviations wherever possible was a good one. They save space and are generally understood. But of late a number of inquiries have come into us concerning the initials C.A.V. "Oh everyone knows what that stands for," everyone shown the letters said. Oh yeah?

We could easily place M.A.N. (Maschinenfabrik - Augsburg - Nurnberg AG) or M.A.K. (Maschinenbau Kiel Aktiengesellschaft), but frankly, not C.A.V., Div. of Lucas Electrical Services, Inc. So finally we had to hide our red faces and take the matter up with Walter S. Dack, vice president of the American branch, and now we do have the answer for everyone we set wondering.

The abbreviation, according to Mr. D., is for Charles Anthony Vandervell who founded the company in 1893. Mr. V., by the way, is still around though past retirement age, and still visits with the main London plant. He has a brother who runs another London outfit, Vandervell Products. It makes strip bearings under license of Cleveland Graphite Bronze Co. in Cleveland where the American office of C.A.V. is located.

Mr. Dack kindly sent us a pamphlet, No. 501, giving details on the company, and perhaps may make the same available to others who may be interested.

Metal Cutting Study

During the coming year Columbia University, under a $10,000 grant from the American Society of Tool Engineers, will undertake a series of studies on the distribution of heat generated during the cutting of metals. The studies will attempt to fill in some of the blanks in metal cutting technology for more realistic specifications of tool forms, cutting angles and speeds, feed and depth of cuts.

High-Speed Dynamometer

The Dynamatic Div. of Easton Mfg. Co., recently shipped a 10,000-hp, high-speed, eddy current-absorbing dynamometer, to be used with another such unit shipped some years ago, to provide test facilities to 20,000 hp. The units have a speed at this horsepower of from 600 to 5800 rpm. The combination is said to be one of the largest such installation ever built.

To permit runs to 15,000 rpm, a gear reducer is located between the unit under test and the dynamometers. All are mounted in trunion bearings so that the torque developed can be read on weighing instruments. By obtaining torque and speed values, the horsepower developed may be determined.

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Mutual Bichromates and Chromates are being used as corrosion inhibitors in an ever-increasing number of applications. In most instances the amount of chromate is so small and the cost so low when compared to the value of the equipment protected that chromate is preferred over other inhibitors.

Typical uses for Mutual Chromate corrosion inhibitors are in cooling towers, heat exchangers, condensers, engine and compressor jackets, boilers and idle equipment, hydraulic systems and refrigerating brines. Write to our Research and Development Division for recommendations for using Chromates in your equipment or process.

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news of our industry

Barges to Ship Natural Gas

Willard L. Morrison, developer of the deep-freeze principle of refrigeration, has come up with an idea for transporting natural gas in liquefied form from New Orleans to Chicago. If it is successful, it may broaden areas of distribution, including those inaccessible by pipeline, and will make available Middle East and Venezuelan gas which is now being wasted.

The project involves specialized application of the gas wherein part of the costs are offset by refrigeration at the Chicago terminus of the system. Mr. Morrison has contracted with the Ingalls shipbuilding interests at Pascagoulia, Miss. for the first of eight special barges, each to have a capacity equivalent to 100,000,000 cu ft of gas. They will use the Mississippi and Illinois Rivers.

Under the plan, gas will be liquified under pressure aboard the barges and regasified at its destination. It is claimed that the gas will be available at savings over natural gas now reaching Chicago by pipeline. The possibilities both for refrigeration benefits and for long hauls are interesting many. Arthur D. Little, Inc., consulting engineers, revealed that it is negotiating with a number of large firms wishing to study the method.

The first barge now under construction will have five vertical tanks, 50 ft in diam and 22-ft high, lined with 1-ft thick balsa wood insulation. A small amount of each shipment of gas will be used en route as motive fuel. The barges are expected to have a delivery cycle of from 11 to 14 days.

RR Studies Motive Power

Great Northern Railway has launched an extensive study of its use of electricity in train operation in the state of Washington. Answers are sought to questions about diesel-electric vs. all-electric use in the territory, with emphasis on relative costs.

Currently, 74 miles of the main line between Wenatchee and Skykomish, Wash. is electrified, the mileage including the Cascade Tunnel which cuts through the Cascade Mountains and is the longest railway bore in the Western Hemisphere. Locomotives powered by electricity fed from overhead wires now move all trains on the line and do switching on 21 miles of connected yard and siding track. Diesel-electric locomotives are used both westward and eastward of the electrified zone.

The study is scheduled to take about a year. Engineers of the road, joined by those of other firms, will survey factors of operating economy, and costs and other phases of installation and maintenance of equipment required for the two types of motive power.

Three possibilities are considered. One is to eliminate the electrified zone entirely; another to shorten the electrified segment to just the Cascade Tunnel length of 7.79 miles; and the third is to extend the electrified zone westward from Skykomish. Great Northern officials emphasize that they don't have any changes specifically in mind. Study findings will determine whether any operating changes result.

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...and so can this!
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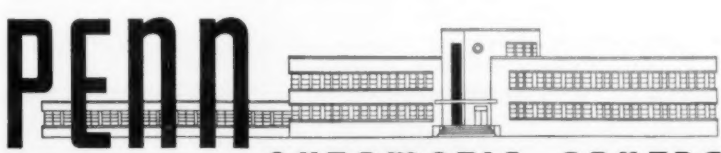

AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, GAS APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

news of our industry

Remote Control Switching

By means of existing telephone lines and a system of relays, diesel locomotives can now be equipped to start by telephone anywhere on the Pittsburgh and Lake Erie Railroad, affiliate of the New York Central. John F. Nash, vice president of the line, approved the installation of the system after witnessing a demonstration.

The invention by Dale W. Shackley, superintendent of communications, and James J. Wright, manager of equipment, is said to provide a practical and economical solution for the protection of diesel engines out of service at remote points. It gives a man at a central control point constant supervision, preventing freezing, overheating, unauthorized movements, and detecting vandalism. It is called the Electrical Supervisory System for Switching Locomotives and has been nicknamed DAD for "dial a diesel."

There is a relay box or plug-in station beside each track where engines are to be left when out of service. From the station, a cable is run to a receptacle on each locomotive. Each engine's electrical circuit is arranged so that relays from the plug-in station enable it to close its own starting contact. A temperature relay system is also contained to indicate when water temperature reaches a pre-set low or high, which when reached, causes a bell to ring on the locomotive and at the control station.

At the control station, the operator then works various engine codes to determine the engine requiring attention. He first hears the fuel pump start and then the engine crank if the alarm comes from a cold engine. Or he can operate another code to shut off an overheated engine. Should the engine not be operating normally, he can shut it off at any water temperature.

Another control enables the engine to be shut off so that it cannot be started from the center but requires an inspector to start it on the scene. If a plug at the engine receptacle is disconnected, it is automatically signalled to the control center so that necessary protective steps can be taken.

On one telephone circuit, it is announced, 241 diesel units can be controlled. Tests have shown that diesels can be started on the P&LE from as far off as New York, although distance is said to mean nothing in the operation of DAD.

F-M Diesel Locomotive Decennial

To celebrate the 10th anniversary of the building of its first diesel locomotive, Fairbanks, Morse & Co. held a ceremony at its Beloit works and presented officials of the Milwaukee Railroad with the keys to a new 1600-hp all-purpose locomotive which is part of a recent order for these units. The original locomotive, a 1000-hp switcher also sold to Milwaukee, was on hand to pull out the new unit.

In his welcome speech, V. H. Peterson, vice president—railroad division, pointed out that over 1½ million hp of the company's opposed piston engines are in use in all of the leading railroads. The company has 41 customers, 38 of them railroads, and has sold nearly 1000 locomotive units.

C.A.V.

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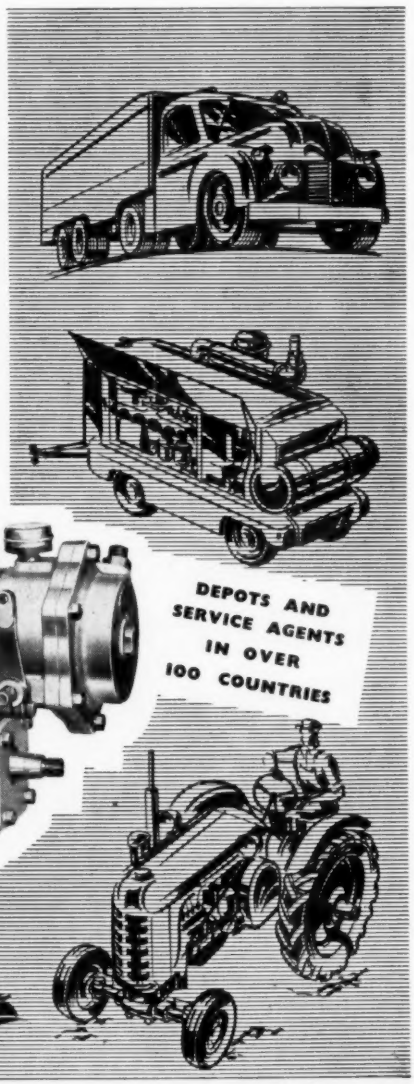

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C.A.V. Fuel Injection and Electrical Equipment

174-607

news of our industry

British Free-Piston Gasifier

Alan Muntz and Co., Ltd., England, has completed prototypes of a small inward-compressing free-piston gasifier operating on the principles patented by the Marquis de Pescara from 1922, it was recently made known. The structure of the engine has been designed to meet requirements of large scale production, with advice provided by General Motors Corp. which holds world-wide rights and which will take delivery of the gasifiers in the near future.

The engine has a continuous maximum rating of 420 gas hp at 59½-psia delivery pressure. Shaft output of the gasifier and turbine combination is put at 350-370 bhp with a thermal efficiency into gas of 42% achieved on test, equivalent to about 37% on the turbine shaft. One hour rating is 500 gas hp at delivery pressure of 65 psia.

Because of lightweight piston assemblies of the inward-compressing layout, the CS-75, as it is called, utilizes a relatively high oscillating speed of 1000 cycles per min at continuous rating. The gasifier weighs about 2 tons or almost 10 lb per gas hp. Cylinder dimensions are 7½-in bore for the 2-stroke diesel section and 20¾-in bore for the air compressor. Stroke of each piston assembly at continuous rating is 9½ in, rising at higher outputs to a maximum of about 10½ in.

An important advantage which the gasifier-turbine combination is said to have over the straight gas-turbine cycle is said to be its relatively low gas temperature. In this case, the power gas is generated at a 4-atmosphere pressure and a 869°F- temperature so that the turbine can be manufactured from low-alloy materials. Welding is widely used. All parts requiring inspection are readily accessible and removable. All components subject to wear are small so that replacement will be inexpensive. Ease of dismantling is also a feature.

Copper and Brass Service

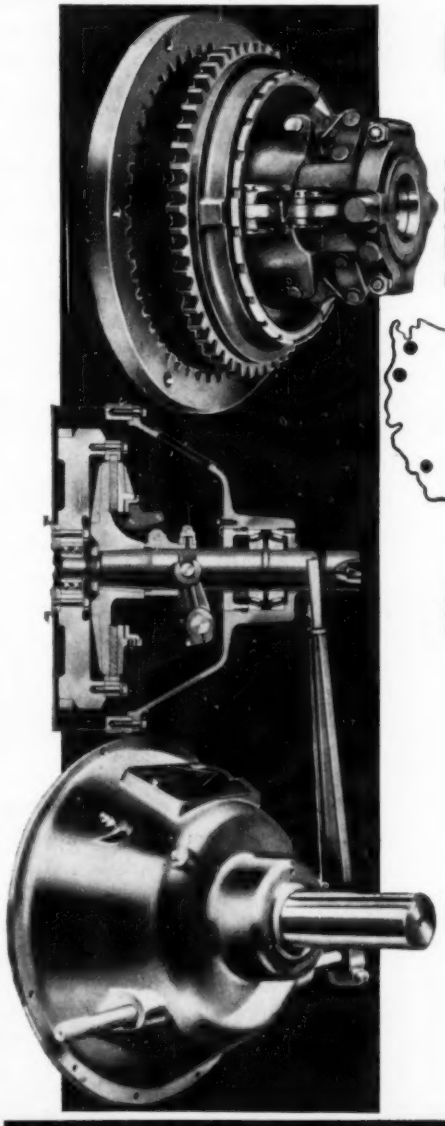
Expected to ease bottlenecks and cut lead time on production schedules is a free service instituted by Copper and Brass Warehouse Assn., Inc. Under it, members of the association will pool their information on hard-to-get items and a user should be able to obtain them in little more than a week.

According to the plan, if a contractor wishes to get a particular shape and alloy that his local warehouseman cannot supply, the warehouseman will call headquarters. The product will then be listed and any member who has the product will be asked to wire the member warehouseman who needs it. Through the plan every local warehouseman has at his disposal virtually the entire stock of every other warehouseman in the country.

UP Orders 50 Diesels

Union Pacific Railroad announces that it has placed an order for 50 diesel freight locomotives with the Electro-Motive Div. of General Motors Corp. Cost of the GP9-type 1750-hp units is $8,680,000. They will bring the total number of freight units purchased by the road this year to 240.

ROCKFORD Heavy Duty CLUTCHES
and
Power Take-Offs
Are Distributed
Coast to Coast



Wherever industry uses heavy duty clutches or power take-offs there is a ROCKFORD distributor conveniently close at hand to supply ROCKFORD Heavy Duty CLUTCHES, POWER TAKE-OFFS and replacement PARTS for numerous types and sizes of each.

These ROCKFORD DISTRIBUTORS and DEALERS carry a stock of clutches, power take-offs and replacement parts to insure ROCKFORD clutch users prompt delivery and service.

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Lightbourn Equipment Company, Dallas, Texas
Atlas Auto Parts & Grinding Co., Louisville, Kentucky
Wepco Equipment Company, Cleveland, Ohio
Genuine Motor Parts, Pittsburg, Pa.
Auto Clutch & Parts Company, Chicago, Illinois
Auto Gear & Parts Company, Philadelphia, Pa.
General Machine Parts, New York, N. Y.
Highway & Industrial Equipment Co., Inc. Raleigh, N. Carolina
R. Angus (Alberta) Ltd., Edmonton, Alberta, Canada
Maase Equipment Co., Ltd. Montreal, Canada
B-W-H Service Parts, Ltd., Merritton, Ontario, Canada
Credle Equipment Company Utica, New York
Engine Service & Supply Company Odessa, Texas
National Supply Engine Corp. Portland, Ore. and Seattle, Wash.

ROCKFORD CLUTCH DIVISION BORG-WARNER
1301 Eighteenth Avenue, Rockford, Illinois, U. S. A.

DIESEL FUELS *and* DIESEL FUEL ADDITIVES

Claims are no component part of a fuel or of an additive

Performance records of actual commercial operation over substantial periods of time are reasonably good evidence in any case. The composite records from the storage and supply tanks to the end of the exhaust pipe tell the tale.

We offer to Refiners, Compounders and Blenders and also to Operators of Diesel powered equipment, free of cost, sufficient Auxiliary Factor #100-D to treat 5,000 or 10,000 gallons of Diesel Fuel to stabilize and upgrade it and with no further obligation than to use it. Just write us as to the amount of fuel you wish to blend. Shipment will be made promptly on an invoice marked "No Charge."

Research and development of additives has been our exclusive business for nearly seventeen years. The line is known as AUXILIARY FACTORS. They have been in use over millions of miles on land, water and in the air.

Auxiliary Factor #100-D (Diesel Fuel Additive) was developed with full consideration of the variables existing in Diesel Fuels such as:—solubles and insolubles, reactions in mixed fuels, electro - chemical reactions, cetane ratings, and also as to the variables in equipment effecting ignition and combustion. The effective range of this additive is excellent.

We welcome the liberal acceptance of the above proposition. For additional information, write or phone

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West Coast Distributors
Peninsula Associates, H. A. Kazanjian, Gen. Mgr.
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Phone WH 8-3408—Cable P.E.B.S.A.

What Do You Know!

(*Answers to questions on Page 44*)

1. Correct answer is "c". GM's new Turbocruiser differs in general design only in the exhaust arrangement and lack of rear windows. See Page 40 for a description.

2. "b" is correct. Subsoil characteristics are as important here as in building foundation design. For an example where special treatment was needed, see article on Page 38.

3. Correct answer is "b". Exhaust gases, radiated heat, and cooling water heat are all dissipated to the atmosphere. For discussion, see the article starting on Page 46.

4. Again "b" is correct. Provision must also be made for radiated heat from the engines, generators, exhaust lines, etc. See article mentioned above for details.

5. Correct answer is "a". Gas can be controlled quite easily with pressure regulators, but pressure and temperature control of air is more of a problem. See article mentioned above for discussion.

6. Correct answer is "c". While "a" is true in the sense that the air would be less dense and a larger unit needed, the major difficulty is the small temperature differential. See article above for details.

7. "b" is correct. While this equipment is a major consideration, it is not all that must be done. For example, provisions for fuel recirculation have been found desirable. See above-mentioned article and also one on Page 58.

8. Correct answer is "b". Changing nozzle rings has been effective in broadening adaption. See the article on Page 45 for details.

9. Correct answer is "c". The Pennsylvania's Altoona shop is considered the largest. See article on Page 34 for a description.

new literature

Oil Conditioners

Modern techniques of reclaiming lubricating and transformer oils as practised in the utilities field and the metal working industry are the subject of a study just released by the Industrial Filtration Div., U. S. Hoffman Machinery Corp., 219 Lamson St., Syracuse 6, N. Y.

Sixth in a series of case studies, the 4-page bulletin also discusses the use of conditioners in the pumping stations of oil pipelines. The filter-vaporizer combination, according to the study, provides an inexpensive, single operation method for restoring diesel engine lube and transformer oils to "like new condition". Illustrations show the conditioners' uses.

Engine Pre-Heater

Preparing for cold weather, Kim Hotstart Mfg. Co., W. 917 Broadway, Spokane 1, Wash., announces availability of literature describing its electric pre-heater for diesel and gas engines.

Principal users of the Kim Hotstart, a device which plugs into an electrical outlet and keeps engine ready for instant starting, are fleet owners in transportation and construction. Typical installations are shown and specifications listed for sizes and types.

Electrical Connectors

Bulletin 71 is offered by Thomas & Betts Co., Inc., Elizabeth 1, N. J., as a single reference covering its complete line of electrical distribution and service connectors. For convenience in making changes and additions, pages are bound loose-leaf.

Feature of the publication is its graphic index which is a composite sketch of distribution fittings from pole to service entrance. Each type of connector is related to a specific page in the catalog. Full descriptions, listing uses and sizes, are given in tabular form throughout the catalog, with spot diagrams focusing attention on the location where each connector is used. Additional listings include the company's UT5 installing tool, aluminum cable adapters, and other fittings.

new literature

Catalog on Tubing Tools

A pocket-size catalog, providing condensed listings of its complete line of tube working tools, is being offered by The Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago 7, Ill.

Included in the booklet are tools for cutting, flaring, bending, swedging, reaming, and pinch-off of tubing. There are also test plugs and tools for refacing flared fittings. Tools are for copper, aluminum, steel, and stainless steel.

Preventive Maintenance Aids

Locating troubles in air-cooled and water-cooled air compressors is the subject of a new self-mailer now being offered by Worthington Corp., Harrison, N. J. It is one in a series on preventive maintenance being issued to assist manufacturers in reducing operating costs.

The leaflet is graphically illustrated and contains an itemized list of points to check for each difficulty encountered. Reasons are given for such operating difficulties as failure to deliver air, insufficient capacity, insufficient pressure, vibration, overheating, knocks, and so on.

U.S. Seeks Inventions

How's your inventive genius? The armed services are looking for a long-life battery that can be used in a wide temperature range. Also a coaxial r-f switch, miniature hermetically sealed transistor cartridges, and a precision method for growth of large single silicon crystals. These are among a list of 200 technical problems confronting the military forces published by the National Inventors Council, U.S. Dept. of Commerce, Office of Technical Services, Washington 25, D.C.

Others on the list include a protective coating for magnesium alloys, machinery for fabricating and welding titanium, and a metal-to-metal adhesive. Solutions to the problems, or ideas that may lead to solutions, are sought by the council. Copies of the list are free of charge.

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Save Time and Money with Luber-finer's FASTER SIMPLIFIED Pack Replacement

Luber-finer Exclusive Features:

- **Single Bolt Closure**—Ingeniously designed Clamping Ring utilizes Single Bolt Closure for quick, easy Pack Replacement.
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For Complete Information Write Dept. 41

LUBER-FINER, Inc.
2514 S. Grand Ave., Los Angeles 7

news of our industry

Municipal Adds Diesel Unit

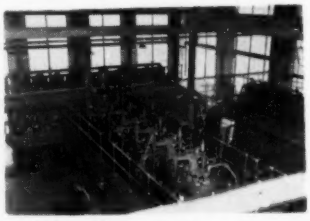
Hillsdale, Mich., recently celebrated the formal addition of a new diesel unit to its power plant system. The municipal utility has been serving the community since 1883. Its first diesel was placed in operation in 1939.

The first unit was a 2250-bhp air injection Nordberg of the crosshead type, 2 cycle, driving a 1500-kw Allis Chalmers 2300-v generator. A new building was erected to contain the unit with space left for an additional one, installed in 1947. It was a 3600-bhp mechanical injection, crosshead type, driving a 2500-kw, 2300-v A-C generator.

In 1953, an addition to the diesel building was made and the latest Nordberg, a 4200-bhp capacity unit driving a 3000-kw, 4160-v A-C generator was installed. Here also, ample space was left for another unit of similar size. To celebrate this latest installation, a banquet was held this summer.

The new unit had first been placed on light load in May of this year and operated a few hours each day to break it in and make adjustments. In June the acceptance test run began. It was operated at ½ load, ¾ load, full load, and 10% overload. On conclusion of the test the unit was placed in daily operation except for week-ends when the smaller units took over.

At the banquet, the new unit was officially placed in line and synchronized with the system. It is the first in the plant to generate at 4160 v and is tied to the 2300-v system through a transformer and outside switchgear.



This is the first step in a program to eventually have the whole system generating at 4160 v and will bring all switches outdoors. The photograph shows the new unit at the rear, installed at right angles to the older units.

New Switch on Inventions

Fatherly ingenuity and science is keeping a small boy safely home in bed. Father installed a tiny precision-acting switch in Junior's bed and connected it with a buzzer in his room. When the boy takes off on a sleep-walking expedition, removal of his weight from the bed closes the switch and sounds the buzzer. The idea is representative of hundreds submitted in an idea exchange conducted by Minneapolis-Honeywell Regulator Co. to learn what unusual uses have been found for the switches.

Other inventors have come up with gadgets that do everything from shushing the television at commercial time to automatically bailing out a boat, detecting shoplifters, preventing the bathtub from overflowing, automatically winding clocks, or serving as a canine doorbell. One of the company's travelling salesmen submitted a device called "berth control." It uses one of the switches to dowse night light, cooling fan, and filtered air heater when Pullman porters put up empty beds.

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You've never seen so much helpful information on panel instruments packed into such handy easy-to-use form. One master chart shows all standard DC and AC ranges, cases and prices. Includes round, square, rectangular and fan-shaped . . . bakelite and metal . . . hermetically sealed and sealed ruggedized instruments. It also has dimensions and capsuled engineering data.

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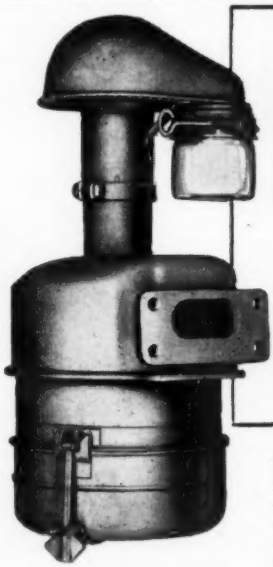

Donaldson Air Cleaners are EASY TO SERVICE!

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MODEL GHM

SPEED SENSITIVE SWITCHES

Synchro-Start units are available in two body designs for one, two and three switches. The GS series is for a standard distributor take-off with gear or coupling drive and has oilless bronze bushings. The GH body is for standard SAE tachometer drive and runs in oil sealed ball bearings.

These units contain snap action switches rated at 10 Amps.-110 Volts A.C. and can be used for either opening or closing a circuit at any RPM over 500. Adjustable while the engine is running for a plus or minus 20% of set speed.

The model shown here was designed for overspeed shutdown and is made for either automatic or manual re-set. Dust caps can be furnished with a variety of standard or special connector fittings.

SYNCHRO-START PRODUCTS, INC.
Automatic Engine Control Equipment
8151 NORTH RIDGEWAY AVENUE, SKOKIE, ILLINOIS

Preparation of Residual Fuels

(*Continued from page* 58)

to maintain the proper viscosity established for optimum injection and combustion. Guesswork is eliminated in selecting the proper temperature for a given batch of oil for the right viscosity.

If it were desired to maintain proper viscosity by traditional methods it would be a matter of withdrawing samples and conducting laboratory analyses with a batch-type viscometer. Such laboratory reports are frequently valueless due to the time lag between sample and report, also due to the possibility of obtaining a sample not representative of the actual viscosity.

So it is seen that although this system employs essentially the same treatment as has previously been used in preparation of heavy fuels for diesel engine consumption, the addition of automatic control of temperature and thus viscosity, assures uniformity of this fuel characteristic. At the nozzles, this will be maintained regardless of the original viscosity of the fuel being used.

It is of course essential that the fuel be as free as possible of harmful contaminants. The two stages of centrifugal purification do a good job on this. By providing better than double the capacity in the centrifuges than would be required for a distillate fuel, optimum fuel cleanliness is assured. This system is reported to have turned in cylinder wear rates that equal those in the same engine when previously using light oils for fuel.

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new literature

Morse Cam Clutches

Morse Chain Co., 7601 Central Ave., Detroit 10, Mich., is making available a 4-page catalog on its Series 200 cam clutches for indexing, over-running, and backstop machine drive applications.

Typical installation drawings, application data, and a complete table of specifications are given for seven models of clutches having torque ratings from 10 to 500 ft lb.

Flanges for Gaskets

Latest in a series on the gasket, published by Johns-Manville, 22 E. 40 St., New York 16, N. Y., is a booklet entitled "How Flange Surface Finishes Affect Gasket Sealability and Joint Performance". For those who buy, specify, or design joints in which gaskets are used, the booklet should be of help.

It provides a basis upon which to select the flange surface finish most suitable for a given gasket and explains why the right finish makes it easy to achieve an initial seal and obtain best joint performance in service.

Lead Screw Tapping Tools

Automatic Methods, Inc., 965 W. Grand St., Elizabeth, N. J., has issued several bulletins on its complete line of lead screw tapping tools. The new Auto Tap tapping heads described in Bulletin 601 incorporate a lead screw, reversing mechanism, and depth control in a single unit which clamps to the quill of a drill press.

Attachments for converting drill press tapping setups to lead screw tapping are described in Bulletins 201 and 103. Advantages of the method, simple fixtures, typical applications, and complete specifications are included in the bulletins.

Diesel Engine Lubrication

Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa., is offering a revised and updated edition of its technical bulletin, "Lubrication of Diesel Engines".

Fully illustrated, the 50-page publication discusses diesel principles and design, types of engines in use, operating cycles, engine accessories, and the choice of the correct diesel lubricants. A quick-reference trouble-shooting chart lists remedies for faulty performance.

Heavy Oil Purification Data

In view of the growing use of low-cost heavy fuel in diesel engine operation, Centrico Inc., 75 W. Forest Ave., Englewood, N.J., announces preparation of a 16-page booklet, "Centrifuges for Oil Processing".

The publication gives performance data on three oil separator models for purifying both fuel and lube oils. Special emphasis is on No. 6 residual oil. The company's new hydraulic lifter and exchangeable bowl liners are also described. Ask for booklet No. 205.

Manual Handling Equipment

A pocket-size catalog, illustrating and describing its complete line of special manual handling equipment, is available from the Kennett Equipment & Machinery Co., Kennett Square, Pa.

The literature details examples of specially designed trucks, racks and containers manufactured from stainless steel, monel, angle iron, and aluminum. More than 40 different units are pictured, together with complete specifications, construction and design features, and application data.

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organizational news

National Supply Representative

G. L. Bader has become a special representative of the engine division of The National Supply Co. His principal concern will be with engines for natural gas and petroleum pipeline use, but he will also handle marine and stationary engine applications in the vicinity of his headquarters at St. Louis, Mo.

Mr. Bader has had more than 25 years of experience in the diesel industry, having been associated with Fulton Iron Works, Baldwin-DeLaval, Busch Sulzer Co., and Nordberg Mfg. Co. He has served as a consulting engineer since 1951.

G. L. Bader

New U.S. Steel Manager

The Oil Well Supply Div. of U. S. Steel Corp. announces the advancement of J. M. Haynes to the position of manager of engine and compressor sales to replace W. C. Ramsey who has retired.

Mr. Haynes started with the division in 1934 in machinery and sales service. He was appointed sales engineer in 1941 and became assistant manager, engine sales and service, in 1947. In 1951 he was appointed assistant manager, engine and compressor sales, his most previous position.

G-M 6-71 DIESELS

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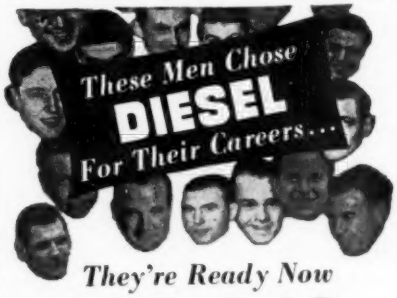

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DIESEL VESSELS

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organizational news

S. E. Wardell

Two Managers for Penn

H. O. Penn Machinery Co., Inc. has made known the appointment of Stanley E. Wardell as sales promotion manager and Robert C. Meyer as general service manager.

Mr. Wardell has been sales representative for the company for the past 10 years, most recently in Queens, N. Y. The greater part of his work will be closely allied to that of the sales manager although he will also work with other department heads and with factories furnishing the heavy construction equipment distributed by the company.

Mr. Meyer comes to the company directly from Caterpillar Tractor Co., where he has been field service representative for the past six years. His responsibilities will include training and education of service personnel and coordination of policy and methods of servicing in the four Penn service shops.

R. C. Meyer

New Nordberg Executives

The Heavy Machinery Div., Nordberg Mfg. Co., has appointed Hans U. Lieberherr to the post of director of engineering and Emil Grieshaber as director of projects development.

Mr. Lieberherr joined Nordberg in 1949 as technical representative in Europe, with headquarters in Paris. Before that he was with Sulzer Bros. in Winterthur, Switzerland for 20 years, his first position as a designer for double acting 2-cycle engines. In 1936 he became chief engineer in charge of design of Navy-type engines for submarines and surface vessels.

Emil Grieshaber

Hans U. Lieberherr

Mr. Grieshaber was active in experimentation and development of diesel engines in Belgium for two years before joining Nordberg in 1915. He provided technical assistance in development of early Nordberg diesels. He was later appointed head of the steam engine and compressor department and in 1936 was named chief engineer. He is said to have been chiefly responsible for Nordberg's development of heavy-duty 2-cycle engines.

ENGINE PARTS

New connecting rod bearing shells for Busch-Sulzer 6DMFT-17 diesel. Upper and lower half, bronze backed and babbitted, part No. J-4934-1 in original crates. Complete shell, upper and lower half, $45.00.

Connecting rod and bushing assembly for Superior engine model YLO-12-E, new, $75 each.

Manifold gasket for BUDA engine model 6DMCR844.

New sylphon valve complete with temperature regulating bulb and cable, 3", $200 each.

Connecting rod bearing assembly for Sterling Petrel engine.

Cylinder heads with valves for 230 hp Wolverine engines. Connecting rods also available.

Connecting rod bearings for Sterling Petrel engine L-6.

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Unit Capacities
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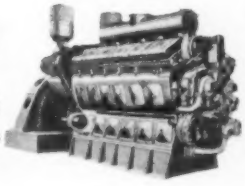
Various Voltages



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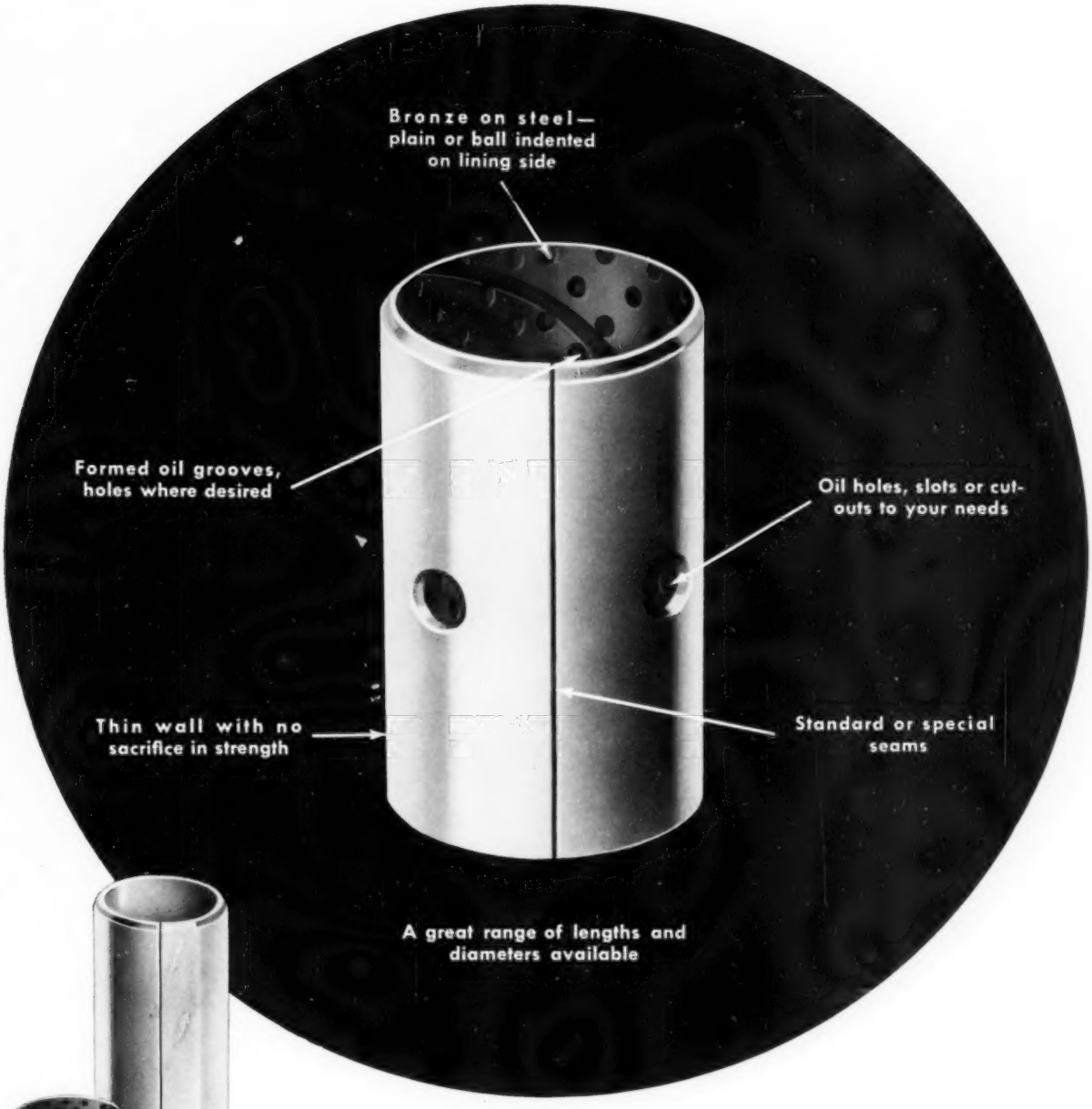

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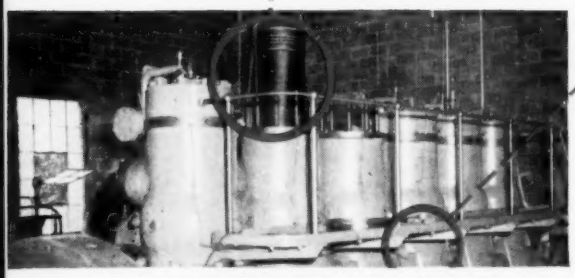
the proof is in these close-up pictures . . .



Piston and bearings are removed from this diesel unit. Closeups show how STANDARD HD Oil kept these vital parts free of carbon and varnish deposits.

taken after 10,500 hours of operation!

A few years ago the Village of Halstad, Minnesota, was up against a serious power problem caused by engine deposits. Power was urgently needed and engines could not be taken off the line for cleaning. STANDARD HD Oil was installed. It performed an outstanding rescue job just when the engines were operating at their worst. Rings became free, deposits were eliminated, the engine began producing at rated capacity—all without any interruption of service.

Naturally plant operators insisted on STANDARD HD Oil when they installed their new 6-cylinder engine. Here too, STANDARD HD Oil has meant savings in time and money. Recently, after 10,500 hours of operation, without overhaul, the new engine was disassembled for routine inspection. Pictures above show that all bearings, pins and rings were found to be as good as new.

Standard Oil lubrication specialist W. G. Waller (right) answers lubrication questions for Halstad power plant operators. There's an experienced specialist near you who can answer *your* questions. Call your nearest Standard office or write to Standard Oil, Chicago.

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